

Rework Eliminator™

K2 Option Bypass Headers

Rework Eliminators™ Companion Guide

Rework-Free Assembly Instructions
for use with the **rev. F**
Elecraft® K2 Manual

Version 8 / Revision C
6 June 2012

Our method is **not** an
official Elecraft® mod!

Ken Kaplan, WB2ART – Oakdale, NY
Gary Hvizdak, KI4GGX – Melbourne, FL

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Revision History

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6 JUN 2012	8	C	Updated the price in Appendix A (footnote 5).
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21 MAR 2009	7	P	Added step to insert UN-KAF2/KDSP2 header for Control board resistance checks.
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16 SEP 2008	7	M	Updated Ken’s QTH on the cover page and deleted our printed Headers User’s Guide from page 2.
29 JUN 2008	7	L	Updated retail prices on page 2.
9 FEB 2008	7	K	Updated Elecraft Inc. copyright notices to cover 2008.
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16 DEC 2007	7	H	Minor typo correction in Appendix A.
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17 AUG 2007	7	E	Minor typo correction and readability improvements.
13 AUG 2007	7	D	Tweaked the document subtitle.
5 AUG 2007	7	C	Changed the document subtitle to include mention of the rev. F Elecraft® K2 manual.
20 MAR 2007	7	B	Minor readability tweaks.
22 FEB 2007	7	A	A correction affecting K2 manual page 56. Do install RF-D1 as instructed per the Elecraft® manual.
22 FEB 2007	7	—	Updated the “How to Use this Guide” section and other minor tweaks.
15 JAN 2007 through 17 FEB 2007	6	A – P	- Removed the beta release watermark. Added our beta tester to the acknowledgments section. - Incorporated lots of beta tester suggestions. - Enlarged the two (new) spacer diagrams, added page numbers. - Yet another beta tester suggestion regarding the annotated footnotes on K2 manual page 60. - Changed our slogan from “Plug & Play Ready” to “Option Ready” to avoid confusing newcomers. - Incorporated beta tester feedback about the uninstalled components on K2 manual page 70. - Moved up KNB2 standoff installation, and compressed the two #5048 images (200 DPI □ 96 DPI). - Added standoff locations to the annotations on K2 manual page 71. - Minor tweaks to K2 manual pages 70 and 71. - Reduced the fading so builders can use this guide to replace the affected K2 manual pages.
18 DEC 2006 through 14 JAN 2007	5	A – N	- Replaced K2 manual “errata style” redlining instructions with annotations, and added “beta” watermark. - Added Appendices – <i>Required Parts</i>, <i>Annotated K2 Schematics</i>, <i>Color Coded Un-module Diagram</i>. - Assembly procedure change to install the SSB Front Panel parts sooner. - Added “firmware” warning about making pre-S/N 4060 K2s “Option Ready” for the K60XV.
APR 2006 – SEP 2006	4	A – F	Incorporated suggestions from LU5OM and DF7TH.
JAN 2006 – APR 2006	3	A – P	Officially published; incorporated comments from KG6XVT, W1SRB, LU5OM, W7GR, and W3FPH.
DEC 2005 – JAN 2006	2	A – K	Alpha and beta test releases with suggested improvements from N9LP and KG6ZVT.
19 DEC 2005	1	—	Pre-releases.

Preface and Acknowledgements

My investigation into the possibility of a rework-free K2 build began in December 2004 after I completed a *High Reliability Soldering* course at the local junior college. This was before Ken’s first Reflector post about his prototype UN-PCB headers, so I started by designing some un-modules using perf-board. In doing so, I noticed an error in the original KE1L article’s description of an UN-KNB2 header. (The value specified for the resistor on the output leg of the attenuator was off / low by 19 percent.) This was a crucial find since Ken and I would soon offer an un-module kit.

Referring to the table on page 4 (excluding mic configuration jumpers) the electrical differences between a bare and an “Option Ready” K2 are the absence of six original components and seven jumpers; and the addition of 15 components, two jumpers, and 12 connectors. Un-modules “undo” 14 of these differences while 12 don’t require undoing. The final piece of the rework-free puzzle was provided by Elecraft’s Scott King (SK) who suggested incorporating the K60XV supplied K2 VCO parts, and changing the new *Extended VCO Range (D19)* menu entry to inform the firmware.

With the introduction of our Rework Eliminator™ brand option bypass header kit, some of our early customers were already using a draft of our rework-free assembly instructions in late summer 2005. Without the encouragement of those pioneers this guide might never have existed. We are especially grateful for the contributions of the following Elecrafters, and for Wayne and Eric’s permission to reproduce portions of the K2 manual:

Scott King (SK), Bruce Bowman (NM5B), Doug Shields (W4DAS), Larry Phipps (N8LP), Eric Jorgensen (KE6US), Sverre Holm (LA3ZA), Mitch Easton (W2MDE), Darrell Bellerive (VA7TO), Bill McCann (K3UJ), Matt Osborn (KC0UKK), Craig Rairdin (NZ0R), Bob Abell (VE3XM), John Crux (G3JAG), Bob Sosin (KD4WNQ), Ed Muns (W0YK), Jeff Bender (KG6ZVT), Craig Smith (AC0DS), Bob Solosko (W1SRB), Manuel Wilches (LU5OM), Rob Locher (W7GH), Joerg Tack (DF7TH), Mike Short (AI4NS), Mark Raybould (G3XYS), Bill Fruit (WA9ACP), Chuck Guenther (NI0C), Bob Zinn (N5BZ), Charles Pitts (N3EJS), Alan Wilcox (W3DVX), Karl-Heinz Kaatz (DF7KHK), Dave Mueller (AA3EE), David Wilburn (K4DGW), Mike Casey (KC9ORD), Mike Weir (VE3WDM), Dick Mobley (AL7B).

Gary KI4GGX
16 September 2010

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Introduction

This guide describes a rework-free assembly method for the Elecraft® K2. It incorporates un-module option bypass headers and 46 option supplied K2 parts which include electrical components, connectors, miscellaneous wire, and mounting hardware. Our instructions seamlessly combine initial K2 assembly with the changes that must be made prior to installing the options. The result is an “Option Ready” K2 for which the later installation of the options is **dramatically simplified**. When installing the options, **there’s no need for significant disassembly or any additional soldering** on the K2’s three main circuit boards. Except for possibly re-jumpering the mic configuration header (behind the Front Panel) for a different microphone, there’s no need to disassemble the enclosure to add the options.

Other than installing back panel connectors (for the K60XV and K160RX), all that’s required prior to adding any of the options that mount on the K2’s circuit boards is to:

1. Remove the top cover and the option’s associated un-module header(s).
2. If installing the “analog” or the “advanced digital” auxiliary audio filter, first replace a machine screw with the option supplied hex spacer.

After installation, refer to each option’s instruction manual regarding the possible need for Beat Frequency Oscillator (BFO) and crystal filter set up, mic configuration header jumpering, Bandpass Filter (BPF) re-alignment, or Voltage-Controlled Oscillator (VCO) re-calibration.

Disclaimer

Our rework-free “Option Ready” alternate assembly method **may not be appropriate for everyone**, particularly builders who:

- just feel more comfortable exactly following the manufacturer’s assembly instructions.
- want to build the base radio for the absolute minimum (initial) cost.
- do not plan to add any internal options.
- find the annotated K2 manual pages in this guide too confusing or too much additional work to follow.
- have the necessary skills and equipment to perform the rework that’s otherwise necessary to add some options.
- do not mind significantly disassembling the enclosure as required to add most options.
- are not concerned about the resale value of their radio.

If you have already started building your K2, or if you are confused by the instructions in this guide, then we recommend you instead follow the instructions in the Elecraft® K2 manual. IF YOU HAVE A PRE-S/N 4060 K2, PLEASE READ APPENDICES A & B NOW!!

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How to Use This Guide

1. Based on which options you are initially getting with your K2 and which options you want to build it “Option Ready” to accept, review *Appendix A* to determine which (if any) of our *Duplicate K2 PCB Parts Kits* will be required.
2. Visit www.unpcbs.com and order our option bypass *Headers Kit*, plus whichever of our *K2 PCB Parts Kits* you determined will be required.
3. Print (preferably in color) the 17 annotated K2 manual pages in the section entitled *K2 Manual Annotations* (which begins on page 5). You may also wish to print the first five pages of annotated schematics in *Appendix B*.
4. Being very careful to mark the correct pages, add comments on these 17 pages in your actual Elecraft® K2 manual to instead refer to these 17 annotated manual pages.
5. Build a rework-free and very easily upgradeable K2. In doing so, you will learn far more than you would have using Elecraft' original method.

What Is An “Option Ready” K2?

If you were to build and align your K2 using the instructions in the Elecraft® manual, then rework it's three main circuit boards to permit installation of all internal options, but instead of installing any options you just installed un-module bypass headers; and if you also changed the *Extended VFO Range (D19)* Secondary menu setting to ‘yes’, then the result would be similar to a “Option Ready” K2!

This is essentially what you get by following the instructions offered in this guide. The main difference is that using our method, the two procedures – the initial build and alignment, plus the modifications necessary to install every option – are seamlessly combined into a single rework-free and disassembly-free procedure! There is one other difference. With our method you will have already performed VCO calibration with *Extended VCO Range(D19)* set to “yes”, so the subsequent installation of the *K60XV* option might not require re-adjusting RF-L30.

As shown below, you can have this “Option Ready” result by starting out with just a bare K2 and getting duplicates of the 47 K2 parts – which are supplied with the Elecraft® options – from www.unpcbs.com for \$34.35. (You will also require our un-module Option Bypass Headers kit.)

Item	Price	Notes
Elecraft® K2 HF Transceiver kit	\$739.95	Given what's included, the stock K2 is a bargain!
Rework Eliminator™ Option-Ready / Duplicate K2 PCB Parts kits*	\$34.35	Discounted “Option Ready” Bundle ... \$52.00
Rework Eliminator™ Option Bypass Headers kit	\$23.50	
(Bundle Discount) Total	\$791.95	Excluding shipping & handling, and applicable state sales taxes.

* Not required if purchasing a fully loaded K2. **Some (individual) parts kits are required if you are purchasing a partially loaded K2.**



This image of #5048 shows three items which are not part of an "Option Ready" K2: 1) Ken's custom brass plate; 2) the "option supplied" hex spacer which is very easy to install; and 3) RF-J5 (Aux AF) which provides fixed level audio for digital modes. Although adding J5 requires some disassembly and additional soldering, it's not part of an "Option Ready" K2 because it doesn't relate to the installation of an existing Elecraft® option.

The two large white (2-pin) connectors along the right side of the RF board are P6 (Aux RF) and P3 (Aux 12V). They are provided with the options that mount in the top cover. P6 is particularly difficult to install in a completed K2 as it entails removing the heatsink.

Although the Noise Blanker standoff is the only one required by our un-module headers, all four RF board mounted standoffs are included in an "Option Ready" K2 since their later installation requires disassembly of the enclosure, and because (for the K60XV and K160RX standoffs) this disassembly involves removing the heatsink.

Additionally, it's quite likely that someone selling a used option wouldn't bother to disassemble their radio and remove these spacers to include them with the option. (In contrast, the KAF2/KDSP2 provided hex spacer is very simple to remove, although many KAF2 and KDSP2 "sellers" fail to include it when selling these options.)

Rework-Free Assembly Summary

✓	#	Option(s)	PCB	DELETED STEPS	ADDED STEPS	NOTES!
☐	17	KAF2 & KDSP2	CTRL	Do not install R18 & R19	Install J1 & J2 (on top)	Common mounting holes!
☐	28	KSB2	FP	-	Install SSB parts	-
☐	48	KNB2	RF	Do not install R88 (470 Ω) Do not install R89 (100 Ω) Do not install R90	Install 2.7 k Ω at R88 Install a 0 Ω jumper at R89 (W89)	Different value for R88! Jumper wire replaces R89! Nothing goes at R90!
☐	50	K60XV	RF	-	Install D19 & D20	-
☐	50	KSB2	RF	Do not install C167	-	J11 will be installed later
☐	51	K60XV	RF	Do not install 82 pF cap	Install 120 pF cap at C71	Different value for C71!
☐	51	KNB2	RF	Do not install W5	-	J12 will be installed later
☐	51	KSB2	RF	Do not install W2 Do not install W3	-	J9 will be installed later J10 will be installed later
☐	56	K60XV	RF	Do not install W6	-	J13 will be installed later
☐	56	K160RX	RF	Do not install W1	-	J14 will be installed later
☐	57	K160RX	RF	-	Install C13 Install C14 Install C75	-
☐	57	K60XV	RF	Do not install C6	-	J15 installed (on top) later
☐	59	KSB2	RF	-	Install J9, J10, J11	<i>Install UN-KSB2 (2 headers)</i>
☐	59	KNB2	RF	-	Install J12	<i>Install UN-KNB2</i>
☐	59	K60XV	RF	-	Install J13, J15	<i>Install UN-K60XV</i>
☐	59	K160RX	RF	-	Install J14	<i>Install UN-K160RX</i>
☐	60	K60XV	RF	-	Change <i>Extended VFO Range (D19)</i> *	From “no” to “yes”
☐	71	KSB2	RF	-	Install KSB2 standoff	-
☐	71	KNB2	RF	-	Install KNB2 standoff	-
☐	71	K160RX	RF	-	Install K160RX standoff	-
☐	71	KPA100 KAT2 KBT2	RF	-	Install P6 (Aux RF) Install P3 (Aux 12V)	KPA100 requires both plugs
☐	71	K60XV	RF	-	Install K60XV standoff Install “V RFDET” / J13-6 jumper	-

↑ K2 manual page numbers

* Requires post S/N 4059 K2 firmware!

Rework-Free K2 Manual Annotations

KAT2	KBT2	KPA100	KAF2	KDSP2	KNB2	K160RX	K60XV	KSB2	Multiple
------	------	--------	------	-------	------	--------	-------	------	----------

- The color code above is used on the previous page and all following pages, to indicate for which option(s) an annotation applies. If you never intend to install some options, this coding makes it easy to select for which options you want your K2 to be “Option Ready”. Please **only attempt this if you are certain how the assembly procedure changes relate to the options**. If you are unsure, either request assistance, build your K2 so it’s “Option Ready” for all options, or use the traditional instructions in the unaltered K2 manual instead.
 - The KIO2 is not included in this color code legend because the base K2 already provides the necessary connector (CTRL-P4) to support its “Option Ready” installation.
 - Regarding the purple shaded options, it’s possible to build your K2 so it’s only “Option Ready” for just the *KAT2* or just the *KB2T*. However, to make it “Option Ready” for the *KPA100*, your K2 needs to be “Option Ready” for both the *KAT2* and *KB2T*.
- An “Option Ready” K2 means that **no additional soldering on it’s three main circuit boards, or significant disassembly of its enclosure are required to fully load it with options**. However, **you still must follow the post-installation setup, calibration, and/or alignment instructions in each option’s manual!** In addition to installing connectors on the back panel for some options:
 - After installing the *SSB option*, the Beat Frequency Oscillator (BFO) and crystal filters need to be set up, plus it may be necessary to change the jumpers on FP-P1, (the mic configuration header) to support your microphone.
 - After installing the *60 Meters & Transverter I/O option*, the Voltage Controlled Oscillator (VCO) needs to be checked on the 60 meter band. As a consequence, it may be necessary to readjust RF-L30 and then realign the VCO as explained on page 61 of the K2 manual.
 - After installing the *160 Meters & Receive Antenna option*, the 80/160 meter bandpass filter inductors (RF-L2 and L4) must be realigned.
- Building your K2 with “Option Ready” support for all options requires that you **refer to the individual option manuals** when adding some option supplied parts. Thus for the options that you haven’t yet purchased, **you should download their manuals** from the *Manual Downloads* page on Elecraft’s website.
- The markups on the following pages are based on the current set of K2 and options manuals as of 18 December 2006. **Please refer to the section “How to Use This Guide” (on page 2) for recommendations on how to best use these annotations**. And yes, the fading is intentional.
Elecraft’s permission to reproduce portions of the K2 manual, does not constitute an endorsement of our products or rework-free assembly method!

REW•RK-FREE K2 ASSEMBLY

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KAT2	KBT2	KPA100	KAF2	KDSP2	KNB2	K160RX	K60XV	KSB2	Multiple
------	------	--------	-------------	--------------	------	--------	-------	------	----------

☐ Install the 1N4148 diodes listed below. D1 is in the upper left-hand corner of the PC board. If a diode has only one band, the end with the band (the cathode) should be oriented toward the banded end of the corresponding PC board outline. If a diode has multiple bands, the *widest* band indicates the cathode end.

__ D1, 1N4148 __ D2, 1N4148

☐ Double-check the orientation of the diodes, then solder.

☐ Find the component outline for diode D3, near the top edge of the board (right end). Install and solder *resistor* R22 at this location (82 k, gray-red-orange).

☐ Install the small fixed capacitors listed below, beginning with C2 in the upper left-hand corner of the board. (This list includes all of the fixed capacitors on the Control board except the tall, cylindrical electrolytic types, which will be installed later.) The list shows both the value and the capacitor labels, using notation explained in the previous section. After installing each capacitor, bend the leads outward to hold it in place, but do not solder.

Note: Remember to complete all items in each line before moving on to the next. (Install C2, C3, and C4, then C7, etc.)

__ C2, .001 (102)	⇒	__ C3, .01 (103)	⇒	__ C4, 0.47 (474)
__ C7, 330 (331)		__ C6, .047 (473)		__ C8, 39 (39)
__ C9, .01 (103)		__ C10, .01 (103)		__ C12, .0027 (272)
__ C5, .01 (103)		__ C14, .047 (473)		__ C17, .01 (103)
__ C42, 0.1 (104)		__ C16, .047 (473)		__ C11, .01 (103)
__ C19, .047 (473)		__ C21, 33 (33)		
__ C23, .01 (103)		__ C20, .001 (102)		__ C18, .01 (103)
__ C43, .001 (102)		__ C27, .022 (223)		__ C25, 0.1 (104)
__ C26, 0.1 (104)		__ C24, .0027 (272)		__ C31, .01 (103)
__ C34, .001 (102)		__ C30, .047 (473)		__ C40, .01 (103)
__ C35, .01 (103)		__ C36, .0027 (272)		__ C39, .01 (103)
__ C41, .01 (103)		__ C37, .01 (103)		__ C38, 680 (681)

☐ Solder all of the small fixed capacitors.

☐ Be sure that the following electrolytic caps – and any other tall parts on the right side of the CTRL board – are seated flush and standing perfectly vertical. This will ensure adequate clearance between them and the *KAF2* or *KDSP2*.

☐ Install and solder the electrolytic capacitors listed below, which are polarized. Be sure that the (+) lead is installed in the hole marked with a "+" symbol. The (+) lead is usually longer than the (–) lead, and the (–) lead is identified by a black stripe (Figure 4-1).



Figure 4-1

__ C1, 2.2 μ F	⇒	__ C13, 22 μ F	⇒	__ C15, 100 μ F
__ C28, 220 μ F		__ C29, 220 μ F		__ C33, 2.2 μ F
__ C32, 22 μ F				

☐ Install and solder ceramic trimmer capacitor C22. Orient the flat side of this trimmer as shown on its PC board outline.

☐ Using a small flat-blade screwdriver, set C22 so that its screwdriver slot is parallel to the outline of nearby crystal X2.

☐ Locate Q12 (type PN2222A), which is a small, black TO-92 package transistor. Q12 and other TO-92 transistors may have either of the two shapes shown in Figure 4-2. **The large flat side of the device must be aligned with the flat side of the component outline.** The part number may be found on either side.

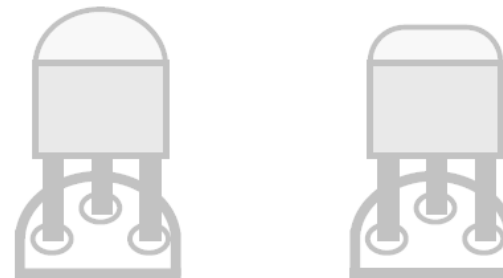


Figure 4-2

REWORK-FREE K2 ASSEMBLY

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KAT2	KBT2	KPA100	KAF2	KDSP2	KNB2	K160RX	K60XV	KSB2	Multiple
------	------	--------	-------------	--------------	------	--------	-------	------	----------

☐ Install a 40-pin IC socket at U6. (The microcontroller will be inserted into the socket in a later step.) Orient the notched end of the socket to the left as shown on the PC board outline. Bend two of the socket's diagonal corner leads slightly to hold the socket in place, then solder only these two pins. If the socket does not appear to be seated flat on the PC board, reheat the solder joints one at a time while pressing on the socket.

☐ Solder the remaining pins of the 40-pin socket.



The connectors used in the following steps have plastic bodies that can may melt if too much heat is applied during soldering, causing the pins to be mis-positioned. Limit soldering time for each pin to 3 seconds maximum (1 to 2 seconds should be adequate).

☐ Install the 2-pin male connectors, P5 and P6. As shown in Figure 4-5, the polarizing tab on each connector should be closest to the top edge of the board. P5, the voltmeter input connector, can be found near the upper left-hand corner of the board. P6 is used for frequency counter input, which is in the upper right-hand corner.

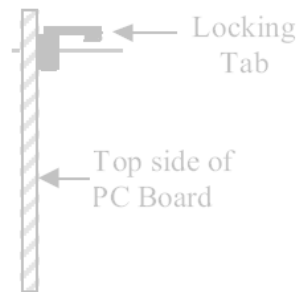


Figure 4-5

☐ Install the 10-pin, dual-row connector, P4 (to the left of P5). The short ends of the 10 pins are inserted into the board. P5 must be seated flat on the board before soldering.

☐ Install P7, a 3-pin male connector (to the right of P5). The short ends of the 3 pins are inserted into the board.

☐ Install a shorting jumper onto the two right-hand pins of P7.

☐ At the upper left and right corners of the board are short jumpers, labeled with ground symbols ($\perp$). Use discarded component leads to make 3/4" (19 mm) long U-shaped wires for each jumper (Figure 4-6). Solder the jumpers on the bottom of the board, with the top of the U-shape approx. 1/4" (6 mm) above the board.



Figure 4-6

⚠ Do not install jumper wires R18 and R19 on the back of the board. Instead, install connectors J1 and J2 on the front as follows.

☐ Install a 5-pin female jack* on the top / component side at J1. It must be seated flush on the board and be standing perpendicular to it.

Solder the center pin only.

☐ Similarly, install a 3-pin female jack* at J2, again **only soldering the center pin.**

☐ Inspect both jacks to ensure they are seated flush against the board and standing perpendicular to it.

☐ Solder the remaining pins of both jacks.

☐ Install the following resistors on the bottom side of the board (solder on the top side):

___ R12, 820 (GRY-RED-BRN)

___ R11, 47 k (YEL-VIO-ORG)

* These connectors are provided with the Elecraft® KAF2 and KDSP2 options or the Rework Eliminator™ Aux Filter Jacks kit.

REWORK-FREE K2 ASSEMBLY

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KAT2	KBT2	KPA100	KAF2	KDSP2	KNB2	K160RX	K60XV	KSB2	Multiple
------	------	--------	-------------	--------------	------	--------	-------	------	----------

Option Components

All component locations on the Control board should now be filled except for the following:

- C44 (top side of the board near the microcontroller, U6). This capacitor will not be used.
- J1 and J2 (bottom side). These two connectors are provided for an audio filter option (KAF2 or KDSP2). An audio filter should not be installed until the K2 has been completed and tested.

Visual Inspection

Nearly all problems with kits are due to incorrectly installed components or poor solder joints. You can avoid these problems by doing a simple visual inspection. A few minutes spent here may save you hours of troubleshooting time.

☐ Make sure there are no components installed backwards. Check all diodes, resistor networks, electrolytic capacitors, and ICs. (The parts placement drawings in Appendix F will be helpful when checking diode orientation.)

☐ Examine the bottom of the PC board carefully for the following (use a magnifying glass if available):

- cold solder joints
- solder bridges
- unsoldered pins

☐ Install a Rework Eliminator™ UN-KAF2/UN-KDSP2 un-module option bypass header at CTRL-J1 / J2.

Resistance Checks

In the table below, "<" means "less than," and ">" means "greater than." When measuring resistances that show a minimum value in the table (such as > 100 k), your resistance reading may be much higher or even infinite. This is typical when using a DMM (digital multimeter). If you use an analog meter you may find that some or all resistance measurements are too low. **Note:** Some digital multimeters will flash their display to indicate an infinite resistance.

☐ Perform the resistance checks listed below to ensure that there are no shorts in the most critical control circuits. (The Control board will be fully tested in a later section.)

Test Point	Signal Name	Res. (to GND)
P2 pin 1	12V	> 10 k
U5, OUT ("5V" pin)	5A	> 2 k
U4, OUT ("8V" pin)	8A	3 - 7 k
Q1 collector	8T	> 1 M
Q2 collector	8R	> 1 M
U3 pin 8	12V IN	> 10 k
U6 pin 13	OSC1	> 100 k
U6 pin 14	OSC2	> 100 k
U6 pin 29	DASH	70 - 90 k
U6 pin 30	DOT/PTT	70 - 90 k
U8 pin 2	VPWR	> 100 k
U8 pin 15	VBIAS-XFIL	> 100 k
U8 pin 16	VBFO	> 100 k

☐ Remove the UN-KAF2/UN-KDSP2 header from the CTRL board to reduce the possibility of damaging it. It will be re-installed again in a later step for phase I alignment and test.

REWORK-FREE K2 ASSEMBLY

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KAT2	KBT2	KPA100	KAF2	KDSP2	KNB2	K160RX	K60XV	KSB2	Multiple
------	------	--------	------	-------	------	--------	-------	-------------	----------

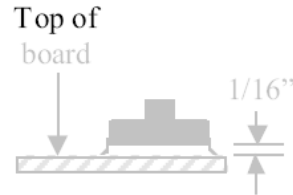


Figure 5-3

Figure 5-3 shows a side view of a switch that is properly mounted (spacing tool not shown). The leads of the switches will just be visible on the bottom of the board. *Proper switch height is important for maintaining an even appearance.*

☐ Once you're satisfied that S1 and S2 are seated correctly, solder the leads (on the bottom side of the board). Leave the spacing tool in place until you've finished soldering both switches.

☐ Install the remaining switches, S3-S16, using the same technique. When you get to S8 through S16, you may install three switches at a time using the spacing tool.

☐ Install the following 1/4-watt fixed resistors, which are listed in left-to-right PC board order. Solder the resistors after all have been installed. (R13 and a few other parts are part of the SSB adapter option, and are not included in the basic K2 kit. A check-list of these components is provided at the end of this section.)

__ R12, 120 (BRN-RED-BRN) ⇒ __ R10, 33 (ORG-ORG-BLK)
 __ R9, 220 (RED-RED-BRN) __ R11, 470 (YEL-VIO-BRN)
 __ R6, 4.7 k (YEL-VIO-RED) __ R7, 4.7 k (YEL-VIO-RED)
 __ R14, 100 k (BRN-BLK-YEL)

☐ Install the following resistors on the bottom of the board. Solder them on the bottom side. Keep your iron tip away from the bodies of the resistors.

__ R16, 15 k (BRN-GRN-ORG) __ R15, 10 k (BRN-BLK-ORG)



When you install the resistor networks in the next step, you must align the dotted end of the network with the pin 1 label on the PC board outline.

☐ Install the resistor networks listed below (top side of the board). Double-check pin 1 orientation and values before soldering.

__ RP2, 120, 10 pins (770101121) (dotted end should be near "RP2" label)
 __ RP1, 100 k, 10 pins (10A1.104G) (dotted end near "RP1" label)

☐ Install and solder the diodes listed below, observing proper orientation as described in the previous section.

__ D4, 1N5817 __ D5, 1N5817 __ D6, 1N5817

☐ Install and solder the following capacitors. C9 is located on the bottom of the board and must be soldered on the top side.

__ C1, .047 (473) __ C2, .01 (103) __ C3, .047 (473)
 __ C9, .01 (103), on bottom

☐ Install PN2222A transistors at Q1 and Q2, near the middle of the board, and solder. These transistors must be mounted so the lead length above the PC board is less than 1/8" (3 mm) to prevent them from hitting the front panel.

☐ There are two ground jumpers on the Front Panel board, one at the far left and the other at the lower right, labeled with a $\perp$ symbol. Use discarded component leads to make 3/4" (19 mm) long U-shaped wires for each jumper. Solder them on the bottom side.

☐ Install a 40-pin IC socket at U1, on the **bottom** of the board. (The IC will be inserted into this socket later.) Orient the notched end of the socket to the left as shown on the PC board outline.

[I] Skip ahead to the section entitled *SSB Components* at the top of page 28 and install all of these KSB2 (or Rework Eliminator™ KSB2 Parts kit) supplied parts now! **This includes the installation and configuration of P1.**

KAT2	KBT2	KPA100	KAF2	KDSP2	KNB2	K160RX	K60XV	KSB2	Multiple
------	------	--------	------	-------	------	--------	-------	-------------	----------

SSB Components

[] Install the KSB2 option or Rework Eliminator™ KSB2 Parts kit supplied Front Panel components* on the front/top of the board near the cutout for the headphone jack.

___ C4 – C8** (.01 µF) ___ Q3 (2N3906)
___ RP3 (10K, 8 pins) ___ R13 (68.1K, 1%)

[] Install P1 (the Microphone Configuration Connector) on the back/bottom of the board. Insert the shorter pins (tails) into the board. **After soldering one pin, ensure P1 is mounted flush.**

Take your time soldering the remaining pins of P1, being careful to avoid touching and damaging nearby switch S6 with your iron.

[] **If you have the Rework Eliminator™ Internal Mic Adaptor (IMA), skip ahead to page 72 and insert a new step to assemble and install the IMA prior to plugging in the Control board.**

Otherwise, review pages 17 and 18 in the Elecraft® KSB2 manual, and **configure FP-P1 for your microphone. (Do this now!)**

(Now go back and resume assembly at the bottom of page 23.)

Visual Inspection (after FP PCB assembly is completed)

☐ Make sure there are no components installed backwards. Check all diodes, resistor networks, electrolytic capacitors, and ICs. The parts placement drawings in Appendix F will be helpful in verifying the orientation of diodes.

☐ Examine the bottom of the PC board for solder bridges, cold solder joints, or unsoldered components.

* Once these components are installed, you may wish to check off all of the steps under the *Front Panel Board Components* section on the bottom half of page 16 in the Elecraft® KSB2 manual. If you haven't yet purchased the KSB2 option, you can download the manual from Elecraft's website, then print out page 16 and keep it with your K2 manual for future reference.

** **For C4 through C8,** do not use any other .01 µF caps that belong to the base K2. Instead, **be sure use the special 5mm (0.200") lead spacing caps** that came with either the Elecraft® KSB2 option, or the Rework Eliminator™ KSB2 Parts kit.

Resistance Checks

☐ Set all potentiometers to their mid-points (approx.).

☐ Perform the resistance checks (to ground) listed below. U1 is on the back of the board.

Test Point	Signal Name	Res. (to GND)
U1 pin 1	IDAT	25 - 35 k
U1 pin 2	ICLK	25 - 35 k
U1 pin 3	/SYNC	40 - 60 k
U1 pin 4	CLK	> 50 k
U1 pin 5	5A	15 - 40 k
U1 pin 6 - 11	Ground	0
U1 pin 12	2V	9 - 11 k
U1 pin 13 - 40	LCD segments	> 50 k
J1 pin 1	AF gain 1	> 1 M
J1 pin 2	AF gain 2	> 1 M
J1 pin 3	AF gain 3	> 1 M
J1 pin 4	DOT/PTT	> 1 M
J1 pin 5	MIC AF	> 1 M
J1 pin 6	ENC B	> 50 k
J1 pin 7	AUXBUS	> 1 M
J1 pin 8	Ground	0
J1 pin 9	SR DOUT	> 50 k
J1 pin 10	SR DIN	> 50 k
J1 pin 11	SR WRT	> 50 k
J1 pin 12	SR CK	> 50 k
J1 pin 13	ENC A	> 50 k
J1 pin 14	SR RD	> 50 k
J1 pin 15	VPOTS	10 - 60 k
J1 pin 16	ICLK	25 - 35 k
J1 pin 17	IDAT	25 - 35 k
J1 pin 18	5A	15 - 40 k
J1 pin 19	RF gain	1.5 - 3.5 k
J1 pin 20	Ground	0

REWORK-FREE K2 ASSEMBLY

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KAT2	KBT2	KPA100	KAF2	KDSP2	KNB2	K160RX	K60XV	KSB2	Multiple
------	------	--------	-------------	--------------	------	--------	-------	------	----------

☐ Plug the Control board assembly into the RF board, with the component side of the Control board facing backwards. (Refer to the photos in Appendix D.) All three connectors on the Control board must be lined up with the three connectors on the RF board at all pins.

☐ Make sure the Control board is pushed as far down as it will go; it should be flat against the RF board along its entire edge, with all three connectors properly mated.



If the Control board does not plug in easily, you may have one or more connectors installed incorrectly.

☐ The long-handled Allen wrench can be used to extract the Control board (Figure 6-11). To the left of J7 on the RF board you'll find the label "LIFT" near a hole at the base of the Control board. Insert the Allen wrench into this hole, then rest the knee of the wrench on the nearby screw head. Pry the board up with the wrench while guiding the board out at the top.

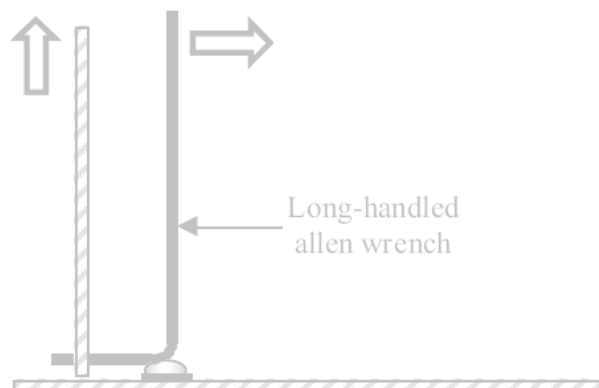


Figure 6-11

☐ Once you have tried the Control board extraction technique described above, plug the Control board back in for the tests that follow.

☐ Secure the front panel and Control boards together using two chassis screws (Figure 6-12). The upper left and right corners of the Control board may be touching the 2-D fasteners, or there may be a small gap.

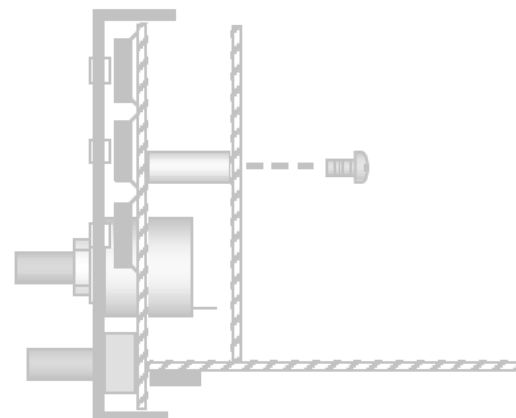


Figure 6-12

☐ Push the black keycap onto S1's plunger until it snaps into place. Test S1's action (push on, push-off). Leave the switch in the OFF position (out).

☐ Install a Rework Eliminator™ UN-KAF2/UN-KDSP2 un-module option bypass header at CTRL-J1 / J2.



KAT2	KBT2	KPA100	KAF2	KDSP2	KNB2	K160RX	K60XV	KSB2	Multiple
------	------	--------	------	-------	------	--------	-------	------	----------

Assembly, Part II

I Remove the UN-KAF2/UN-KDSP2 header from the CTRL board.*

In this section you'll install the components for the synthesizer and receiver circuits. Most of the components to be installed are on the front half of the board (see Figure 6-1). After all of the parts are installed, individual stages will be aligned and tested. Detailed troubleshooting procedures are provided in the Troubleshooting section should you need them (Appendix E). The supplied RF probe will be very useful if you need to do signal tracing. RF probe assembly instructions start on page 9 of Appendix E.

In some steps a large number of components will be installed, then soldered as a group. Check for unsoldered leads after completing each group. A final complete check will be done later.

☐ Remove the screws holding the Control board to the Front Panel board, then unplug the Control board. To avoid damaging any Control board components, use the long-handled Allen wrench as described in Part I.

☐ Remove the bottom cover (six screws).

☐ Remove the screws from the front panel assembly and unplug it from the RF board. Pull it straight out from the bottom edge, near the middle of the panel. This may be easier to do with the transceiver sitting on its right side so that you can steady it with one hand and pull with the other.

☐ Remove the side panels by taking out the two screws along the bottom edge of each panel.

☐ Install the following 1/4-watt resistors, orienting them so that the first band is at the left or toward the back of the board. The resistors are listed in the order they appear on the RF board, starting with R9 (near the left edge, about halfway back).

Note: Remember to complete each line of resistors before proceeding to the next line (i.e., install R9, then R16, then R10).

* It will be re-installed in a later step for phase II alignment and test.

— R9, 100 k (BRN-BLK-YEL) ⇒ — R16, 100 k (BRN-BLK-YEL)
 — R10, 470 (YEL-VIO-BRN) — R31, 10 k (BRN-BLK-ORG)
 — R32, 10 k (BRN-BLK-ORG) — R33, 15 k (BRN-GRN-ORG)
 — R30, 120 (BRN-RED-BRN) — R28, 27 k (RED-VIO-ORG)
 — R20, 270 (RED-VIO-BRN) — R21, 100 k (BRN-BLK-YEL)
 — R22, 3.3 M (ORG-ORG-GRN)

— R25, 2.7 k (RED-VIO-RED) — R24, 2.7 k (RED-VIO-RED)
 — R15, 33 (ORG-ORG-BLK) — R14, 10 k (BRN-BLK-ORG)
 — R13, 10 k (BRN-BLK-ORG) — R12, 560 (GRN-BLU-BRN)
 — R17, 100 k (BRN-BLK-YEL) — R11, 560 (GRN-BLU-BRN)
 — R5, 2.7 k (RED-VIO-RED) — R78, 22 (RED-RED-BLK)
 — R6, 100 (BRN-BLK-BRN) — R7, 68 (BLU-GRY-BLK)
 — R8, 100 (BRN-BLK-BRN)

— R92, 33 (ORG-ORG-BLK) — R91, 820 (GRY-RED-BRN)
 — R93, 820 (GRY-RED-BRN) — R95, 2.7 k (RED-VIO-RED)
 — R72, 470 (YEL-VIO-BRN) — R74, 47 (YEL-VIO-BLK)
 — R96, 2.7 k (RED-VIO-RED) — R97, 33 (ORG-ORG-BLK)
 — R73, 2.7 k (RED-VIO-RED)

— R80, 680 (BLU-GRY-BRN) — R81, 1.8 k (BRN-GRY-RED)
 — R79, 1.8 k (BRN-GRY-RED) — R101, 10 k (BRN-BLK-ORG)
 — R82, 18 (BRN-GRY-BLK) — R111 5.6 k (GRN-BLU-RED)
 — R107, 100 k (BRN-BLK-YEL) — R90, 470 (YEL-VIO-BRN)
 — R112, 22 (RED-RED-BLK) — R88, 470 (YEL-VIO-BRN)
 — R89, 100 (BRN-BLK-BRN) — R85, 150 (BRN-GRN-BRN)
 — R84, 18 (BRN-GRY-BLK)
 — R83, 4.7 ohms (YEL-VIO-GLD)

See notes
1, 2, & 3

☐ Install the resistor networks. Start with RP2, which is in the front left-hand corner. Align the pin 1 mark on each resistor network with the pin 1 end of its component outline.

— RP2, 10 k, 8 pins (8A3.103G)
 — RP6, 100 k, 8 pins (8A3.104G)
 — RP4, 100 k, 6 pins (6A3.104G)
 — RP5, 100 k, 6 pins (6A3.104G)

NOTE: RP3 is not used. The Thermistor PC board will be installed at this location as described on the next page.

- 1) Do not install anything at R90.
- 2) Instead of the original R89, install W89 (i.e. just a bare jumper wire).
- 3) Instead of the original R88, install the 2.7 kΩ resistor (RED-VIO-RED) provided with the Elecraft® KNB2 option, or the Rework Eliminator™ KNB2 Parts kit.



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REWORK-FREE K2 ASSEMBLY

KAT2	KBT2	KPA100	KAF2	KDSP2	KNB2	K160RX	K60XV	KSB2	Multiple
------	------	--------	------	-------	------	--------	--------------	-------------	----------

☐ Locate all of the small glass-bodied diodes. You should have a number of 1N4148 diodes, and one 1N5711, which will be similar in size but should have different markings. Use a piece of masking tape to identify the 1N5711 as "D9, 1N5711."

☐ Install the following diodes, located near the outline for toroidal transformer T5, in the synthesizer area. Be sure to orient the diodes according to their outlines.

___ D11, 1N4148 ___ D13, 1N4148
___ D6, 1N4007 ___ D7, 1N4007

☐ Varactor diodes have a small plastic package, like a TO-92 transistor, but with only two leads. Sort the varactor diodes into groups: type MV209 and type 1SV149. (1SV149 diodes are labeled "V149" and may have a center lead that has been cut flush with the body of the device.) *The K2 will not function correctly if the varactor diode types are interchanged.*

☐ Install the MV209 diodes listed below. The flat side of each diode must match the flat side of its PC board outline. These diodes must be pushed all the way down on the board to prevent stray signal coupling. Bend the leads slightly to hold them in place. D16 and D23-D26 are in the front-left corner. D39 is to the right of J7 (Control board).

___ D16 ___ D23 ___ D24 ___ D19*
___ D25 ___ D26 ___ D39 ___ D20*

Note: Do not install D19 and D20. These are supplied with the ~~K60XV option, which should not be installed until the K2 has been aligned and tested.~~

☐ Install type 1SV149 diodes at D37 and D38, near the SSB option connector. Keep them flat against the PC board, with no excess lead length.

* D19 and D20 are provided with the Elecraft® K60XV option, or the Rework Eliminator™ K60XV Parts kit.

* Older rev. 'A' RF boards (supplied with pre-S/N 3000 K2s) do not have mounting locations for these diodes. If you are assembling an older K2 (with a "rev. A" RF board), you should refer to the K60XV manual to install diodes D19 and D20, (and resistor R29). **Unless you have purchased the K60XV,** we discourage building a pre-S/N 4060 K2 so it's "Option Ready" for the K60XV.

☐ Install the remaining 1SV149 diodes listed below, keeping them flat against the PC board, with no excess lead length. D17, D21 and D22 are in the front-left corner. D29 through D34 are on the right side near the crystal filter.

___ D17 ___ D21 ___ D22
___ D29 ___ D30 ___ D31
___ D32 ___ D33 ___ D34

☐ Install the TO-92 package transistors listed below. Start with Q17, near the middle-left edge.

___ Q17, 2N7000 ___ Q16, PN2222A ___ Q18, J310
___ Q19, J310 ___ Q20, 2N7000 ___ Q24, J310
___ Q25, PN2222A

☐ Install Q21 (2N5109), which is located near U1 in the middle of the board. Align the small tab on the transistor's case with the tab on its component outline. Bend the leads on the bottom to hold Q21 in place, then solder.

☐ Install Q22 (2N5109), which is to the right of the "ELECRAFT" label. Make sure Q22 is flat against the board before soldering.

☐ Carefully press a 3/4" (19 mm) dia. by 0.25" (6.4 mm) high star heat sink onto Q22. The heat sink should be pressed down as far as it will go, and should not touch the components around the transistor. **The heat sink is fragile. If you need to spread it slightly, use a blunted wooden pencil or a plastic wire nut.**

☐ Install Q12 (2N7000), which is to the right of Q22.

☐ Install Q23 (2N7000), near the right-front edge of the board.

☐ ~~Install C167 (.001 µF, "102"), which is near J11, the connector for the SSB adapter. The leads on this capacitor should be formed to match its PC board outline.~~

REWORK-FREE K2 ASSEMBLY

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KAT2	KBT2	KPA100	KAF2	KDSP2	KNB2	K160RX	K60XV	KSB2	Multiple
------	------	--------	------	-------	------	--------	-------	------	----------

☐ Sort all of the remaining capacitors by value to reduce the possibility of assembly errors in the next step. If you are unsure of any capacitor's value and do not have a capacitance meter, the pictures in the parts list (Appendix A) may help.

☐ Install the following capacitors, starting with C86 in the front-left corner. Integer values are in pF and fractional values are in μ F.

— C86, 0.1 (104)	⇒	— C84, 120 (121)	⇒	— C85, 120 (121)
— C100, .001 (102)		— C95, .01 (103)		— C96, 1 μ F (105)
— C71, 82 (82)		— C72, 270 (271)		— C73, 47 (47)
— C74, 20 (20)		See note 1		
— C82, .001 (102)		— C80, .001 (102)		— C81, .001 (102)
— C79, .001 (102)		— C59, 0.1 (104)		— C38, .001 (102)
— C55, .01 (103)		— C61, .01 (103)		— C58, .01 (103)
— C65, 0.1 (104)		— C54, .01 (103)		
— C68, 10 pF (10) *		— C64, .001 (102)		— C67, 0.1 (104)
— C63, .01 (103)		— C92, .022 (223)		— C94, 0.047 (473)
— C89, .001 (102)		— C87, .01 (103)		— C175, .01 (103)
— C62, .01 (103)		— C154, 100 (101)		— C144, 100 (101)
— C156, .047 (473)		— C158, .01 (103)		— C53, .01 (103)
— C52, .01 (103)		— C141, .01 (103)		— C57, .001 (102)
— C146, .01 (103)		— C151, 0.1 (104)		— C145, .01 (103)
— C153, 68 (68) *		— C155, .01 (103)		— C172, .01 (103)
— C177, .022 (223)		— C174, 82 (82)		— C173, 220 (221)
— C178, 0.1 (104)		— C176, 0.1 (104)		— C165, .01 (103)
— C169, 390 (391)		— C168, .01 (103)		— C160, .01 (103)
— C159, .01 (103)		— C143, .01 (103)		— C142, .01 (103)
— C163, .01 (103)		— C162, .047 (473)		— C164, .01 (103)
— C170, .047 (473)		— C166, .047 (473)		— C179, 100 (101)
— C182, 180 (181)		— C184, .01 (103)		
— C185, 0.1 (104)		— C181, .01 (103)		

1) Instead of the original C71 supplied with the base K2, install the **120 pF** cap provided with the Elecraft® K60XV option, or the Rework Eliminator™ K60XV Parts kit. Installation of this alternate value for C71 and diodes D19 and D20 (on page 50) are inseparable, if you install a 120 pF cap at C71, then you must also install D19 and D20. In addition, you must change the *Extended VFO Range (D19) Secondary* menu as described on page 60.

* If you are building an older (pre-S/N 3000 K2) and you want it to be “Plug & Play Ready” for the Elecraft® K160RX, then you need to check that C68 and C153 have the values shown. These two caps are provided with the Elecraft® K160RX option and by the Rework Eliminator™ Replacement RF Caps kit.

☐ Install the following ICs, aligning the notched end of each IC with the notch on its component outline. U6 is at the front-left.

— U6, LMC662	⇒	— U5, LTC1451	⇒	— U4, MC145170
— U3, LT1252		— U10, NE602		— U9, LT1252
— U11, NE602		— U12, MC1350		

☐ Install U8 (78L05), which has a plastic TO-92 package like a transistor. U8 is located near the front left corner of the board.

▲ Do **not** install W5, the *Noise Blanker* option bypass jumper.

▲ Do **not** install W2 and W3, the *SSB Crystal Filter* option bypass jumpers.

☐ Test points TP1, TP2, and TP3 are round, yellow, single-pin female connectors. TP1 and TP3 can be found in the synthesizer area of the board. TP2 is near the SSB option connector, J11. Install and solder all three test points.

☐ Install RF choke RFC13 (100 μ H, BRN-BLK-BRN), near the middle of the board. Orient the first color band to the left.

☐ Install the receive mixer, Z6 (TUF-1 or TOP-1), below the "ELECRAFT" label at the middle of the board. Make sure that Z6 is lined up with its component outline and is flush with the board before soldering.

☐ Install the electrolytic capacitors in the order listed below, starting with C60 near the far left-hand edge. Insert the (+) lead of each capacitor into the hole with the (+) symbol.

— C60, 100 μ F	— C93, 10 μ F	— C103, 220 μ F
--------------------	-------------------	---------------------

KAT2	KBT2	KPA100	KAF2	KDSP2	KNB2	K160RX	K60XV	KSB2	Multiple
------	------	--------	------	-------	------	---------------	--------------	------	----------

☐ Transformer T6 is mounted vertically, near the middle of the board. It uses a different winding technique where the wires for the two windings are twisted together before winding ("bi-filar"). Cut two 12" (30 cm) lengths of enamel wire, one red and one green. Twist them together over their entire length. The wires should cross over each other about once every 1/2" or 12 mm.

☐ Wind the twisted wires onto a 3/8" (9.5 mm) ferrite core (FT37-43), using exactly 10 turns. Use the same method you used when winding non-twisted wires, covering about 85% of the core. Figure 6-19 shows how the winding should look from two views (your turns count will be 10 rather than 8 as in the drawing).

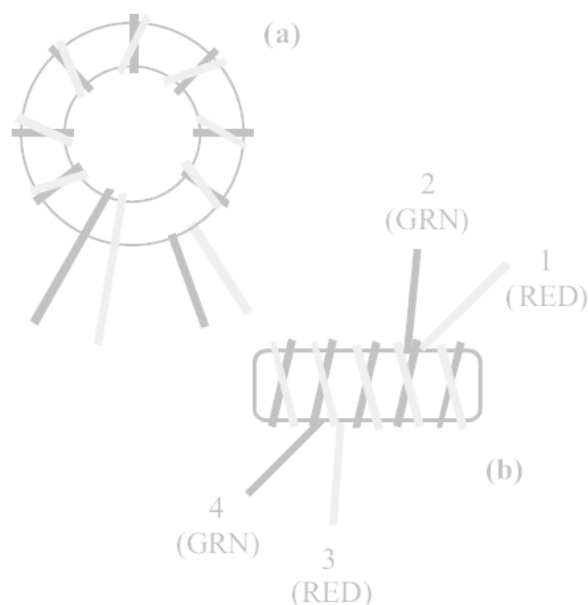


Figure 6-19

☐ Clip and untwist the ends of the red/green pairs so that the leads of the transformer look like those in Figure 6-19 (b). The pin numbers shown match the component outline, with the red wires numbered 1-3 and the green wires numbered 2-4.

☐ Strip and tin all four wires. Be careful not to strip the leads so close to the core that the red/green wire pairs might short together.

☐ Install T6 vertically, with the wires inserted as indicated in Figure 6-19 (b). Pull the leads taut on the bottom, then solder.

☐ Sort the slug-tuned shielded inductors into two groups: 1 μ H ("T1050", quantity 4) and 4.7 μ H ("T1005", quantity 8).

☐ Install 4.7 μ H inductors at L30 and L34 ("T1005"). Press these inductors down as far as they'll go before soldering.

☐ Install the components listed below, starting with C39 in the back left corner (near the key jack).

— C39, .001 (102)	— C4, 820 (821)
— C5, 100 (101)	— C9, .001 (102)
— C7, 100 (101)	
— C8, 820 (821)	— C108, .01 (103)
☐ Do not install W6*.	— D1, 1N4007
— R38, 1 k (BRN-BLK-RED)	— D2, 1N4007
— RFC1, 100 μ H (BRN-BLK-BRN)	
— C107, .01 (103)	— C109, .01 (103)
— C110, .01 (103)	— D3, 1N4007
— D5, 1N4007	— D4, 1N4007
— R37, 100 k (BRN-BLK-YEL)	— R39, 1 k (BRN-BLK-RED)
— C113, .01 (103)	— C114, .01 (103)

☐ Do **not** install W1, the *Receive Antenna* option bypass jumper.

* W6 is the *Transverter I/O* option bypass jumper.

REWORK-FREE K2 ASSEMBLY

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KAT2	KBT2	KPA100	KAF2	KDSP2	KNB2	K160RX	K60XV	KSB2	Multiple
------	------	--------	------	-------	------	---------------	--------------	------	----------

☐ **Review Figure 4-2 before installing Q2 in the next step.**

Q2 is a ZVN4424A transistor, which has a slightly modified TO-92 package. It is flat on both sides, and the labeling may be on the smaller flat side. The *wider* flat side must be aligned with the flat side of the component outline.

☐ Install Q2, which is near C113 (just installed). Be sure to orient Q2 as shown in Figure 4-2.

☐ RFC3 is wound on an FT37-43 core (dark gray) using 16 turns of red enamel wire (12", 30 cm). Wind this inductor in the same manner as RFC14. Install RFC3 vertically, just to the left of W1.

☐ Install 4.7 μ H slug-tuned shielded inductors (marked "T1005") at L1 and L2, near the back-left edge of the board.

☐ Install the 40-meter low-pass filter components, which are listed below. These components are located near Q22 (2N5109 transistor with heat sink).

— C225, 390 (391) — C228, 56 (56) — C227, 330 (331)
— C226, 680 (681) — C229, 220 (221)

— L25, T44-2 (red), 14 turns #26 red enamel wire, 14" (35 cm)
— L26, T44-2 (red), 12 turns #26 red enamel wire, 13" (33 cm)



The leads of some bottom-mounted components may need to be pre-trimmed before mounting and soldering. See Page 11.

☐ Install the following components on the bottom side of the board, starting with C207 at the back left. Once all components have been installed, solder them on the top side, being careful not to damage any adjacent top-mounted components.

— C207, .001 (102) — C216, .001 (102) — C223, .001 (102)
— C224, .047 (473) (bend body down before soldering)
— C204, .001 (102) — C208, .001 (102) — C195, .001 (102)
— C75, 470 (471)* — C13, 1200 (122)* — C14, 1200 (122)*

(continued)

— C133, 0.1 (104) (bend body down before soldering)

— C135, .01 (103) — C122, 56 (56) — C119, .01 (103)
— C17, .001 (102) — C27, .001 (102) — C104, 68 (68)
— C29, 12 (12) — C28, 12 (12)

— R34, 2.7 k (RED-VIO-RED)
— RFC2, 100 μ H (BRN-BLK-BRN) — RFC7, 15 μ H (BRN-GRN-BLK)

☐ Find the "C6" label, along the back edge. The three pads near C6 are labeled "J15" on the top side (for use with the K60XV option). Install C6 (4.7 pF) into the *outer* two of the three pads.

☐ Locate L31, a 12 μ H shielded solenoidal inductor (black case; may not be color coded). L31 is mounted on the bottom of the board, near the right edge.

☐ Install the group of components listed below on the bottom of the board. C183 is near the front left corner.

— C183, .01 (103) — C186, .01 (103)
— C161, .01 (103) — C150, 330 (331)

— C90, .047 (473) (bend body down before soldering)
— C157, .047 (473) (bend body down before soldering)

— R77, 220 (RED-RED-BRN) — R76, 10 (BRN-BLK-BLK)
— R75, 680 (BLU-GRY-BRN) — R94, 82 (GRY-RED-BLK)
— R99, 270 (RED-VIO-BRN) — R98, 270 (RED-VIO-BRN)
— R100, 820 (GRY-RED-BRN) — R110, 5.6 k (GRN-BLU-RED)
— R114, 3.9k (ORG-WHT-RED) — R18, 1 M (BRN-BLK-GRN)
— R29, 10 k (BRN-BLK-ORG)

— R19, 2.7 k (RED-VIO-RED)

— RFC12, 100 μ H (BRN-BLK-BRN)

— D36, 5082-3081 (fragile glass diode; orient banded end as shown)

— RFC10, 1 mH (BRN-BLK-RED)

* These three caps are provided with the Elecraft® K160RX or the Rework Eliminator™ K160RX Parts kit. C75 is on the left edge of the board near K13. C13 and C14 are in the band-pass filter, near L3 and L4.

REWORK-FREE K2 ASSEMBLY

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KAT2

KBT2

KPA100

KAF2

KDSP2

KNB2

K160RX

K60XV

KSB2

Multiple



D40 and D41 were added to the receiver I.F. circuit to prevent saturation when a station a few feet away transmits on your frequency. These diodes will be installed in the steps below.

☐ On the bottom of the RF board, locate resistor R114, which is near the power switch. Near R114 you'll find the 8 pads for I.F. amp U12, which is on the top side of the board (Figure 6-23).

☐ Solder D40 and D41 to the two **round** pads just to the right of R114 (pads #3 and #4 of T7, which is on the top side). The **banded ends of the diodes go in opposite directions**.

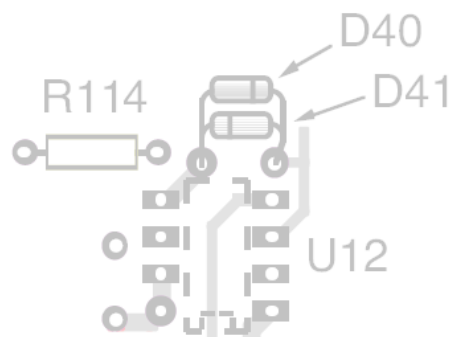


Figure 6-23

☐ Install RF-J9 through RF-J15 per **notes 1 through 4** below, right.

Visual Inspection

☐ Examine the bottom side of the RF board carefully for unsoldered pins, solder bridges, or cold solder joints. Since this is a large board, you should break the examination up into three parts:

___ perimeter of the board ___ front half ___ back half

☐ Examine the top side in the same manner.

☐ Set S1 on the RF board to OFF position. (Plunger OUT).

☐ Skip ahead to the section entitled *Option Module Standoffs* at the top of page 71, and install just the KNB2 standoff now!

☐ Install option bypass headers at CTRL-J1 & J2, and RF-J9 through RF-J15. *Except for the UN-J9/J10, the text on all other headers on the RF board should be right-side up when viewing the K2 from the front.* Secure the UN-KNB2 with a 4-40 × 1/4" machine screw.

Resistance Checks

☐ Perform the following resistance checks:

Test Point	Signal Name	Res. (to GND)
R115, right end (near S1)	12V IN	> 500 ohms
U6 pin 8	8B	> 100 ohms
U4 pin 16	5B	> 1 k
U11 pin 8	8A	> 250 ohms
U10 pin 8	8T	> 500 ohms
U12 pin 1	8R	> 500 ohms



It's very important to re-assemble the chassis as described below before attempting the alignment steps in the next section. If you don't put the chassis together, some results will not be accurate.

☐ Install the side panels and secure with two chassis screws each.

☐ Plug in the front panel assembly. Secure with two chassis screws.

☐ Plug in the Control board.

☐ Secure the front panel and Control boards together using two chassis screws.



Before installing the bottom cove in the next step, verify that all components on the bottom of the RF board have an installed height of 1/4" (6 mm) or less. Capacitors or other parts that stand above this height must be bent downward at an angle to prevent them from hitting the bottom cover.

☐ Install the bottom cover and secure it temporarily using six chassis screws.

1) Install J9*, J10*, & J11* per the steps on page 13 of the Elecraft® KSB2 manual.

2) Install J12* per the steps at the top of page 6 in the Elecraft® KNB2 manual.

3) Install J13* & J15* per the steps on page 7 of the Elecraft® K60XV manual.

4) Install J14* per the steps at the top of page 6 in the Elecraft® K160RX manual.

* Provided with the associated Elecraft® option or Rework Eliminator™ K2 PCB Parts kit.



KAT2	KBT2	KPA100	KAF2	KDSP2	KNB2	K160RX	K60XV	KSB2	Multiple
------	------	--------	------	-------	------	--------	--------------	------	----------

Alignment and Test, Part II

In this section you'll test and align the PLL (phase-locked-loop) synthesizer and receiver circuits. Once this is completed you'll be able to test the receiver using all modes on 40 meters.

☐ Connect your power supply or battery and turn on the K2.

☒ Change the *Extended VFO Range (D19) Secondary Menu* to **Y***.

4 MHz Oscillator Calibration

☐ Plug the frequency counter probe into P6 (Control board).

☐ Connect the probe tip to the PLL reference oscillator test point, TP3 (left-front corner of the RF board, near U4).

☐ Using the menu, select **CAL FCTR**, then hold **EDIT** a second time to enable the frequency counter. The counter should show a frequency of 12090 kHz +/- 30 kHz. If it is 0000.00, changing rapidly, or out of range, you could have a problem with the counter probe or the PLL Reference Oscillator.

☐ Use one of the following methods to adjust C22 on the Control board (listed in order of preference):

- Connect a calibrated external frequency counter probe to TP3, *without* removing the K2's internal counter probe. Adjust C22 until the K2's reading matches the external counter's reading.
- Alternatively, you can use a calibrated short-wave or ham-band receiver. Set the receiver for LSB or USB mode. Connect a short length of wire to the receiver's antenna jack, and lay the end near the 4 MHz crystal on the K2 Control board. Find the oscillator signal on the receiver. Tune the receiver to 4.000 MHz, and adjust C22 until you hear a zero-beat (pitch = 0 Hz).
- If you don't have a counter or receiver, leave C22 set at its mid-point for now. You can improve the calibration later using a calibrated signal generator or an on-air signal, such as WWV (at 10.000 MHz).

* This informs the firmware that you installed a 120 pF cap at RF-C71 (instead of the original 82 pF) and installed RF-D19 and D20, as described on pages 50 and 51.

☐ Access the Secondary menu by first tapping **MENU** and then tapping **DISPLAY** ... **SEC** will be displayed.

☐ Find the **D 1 9** entry either by tapping **BAND +** or by rotating the main tuning VFO knob.

☐ To change the value, first hold **EDIT** for at least ½ second. After releasing **EDIT** use **BAND +** to set it **Y** (meaning, "yes" D19 is installed).

☐ Tap **MENU** twice to exit. **You must keep this change permanently!** Factory reset will undo it, so **you must change it back to Y** if you ever do a reset!

PLL Reference Oscillator Range Test

☐ Set up the K2 internal counter as described for **4 MHz Oscillator Calibration** (at left, first three steps).

☐ If you have an external frequency counter probe connected to TP3 along with the K2's internal counter probe, disconnect it.

☐ When you're in frequency counter mode, the **BAND+** and **BAND-** switches can be used to check the range of the PLL reference oscillator. First, tap **BAND+** and write down the frequency reading below (typically about 12100 kHz). Then tap **BAND-** and write down this frequency reading (typically 12080-12090 kHz).

Ref. High Freq.	Ref. Low Freq.	Range (kHz)
_____	_____	_____

☐ Subtract the lower frequency reading from the higher reading. The range must be between 9.8 and 15 kHz (if not, see Troubleshooting). Tap **MENU** to exit **CAL FCTR**.

VCO (Voltage-Controlled Oscillator) Test

☐ Use **BAND+** or **BAND-** to select the 80-meter band, and set the VFO for a frequency of about 4000.10 kHz.

☐ Connect the frequency counter probe to the VCO test point, TP1. Activate the frequency counter using **CAL FCTR** as before.

☐ You should now see a frequency counter reading in the 8 to 10 MHz range. It may or may not be stable at this time (i.e., the frequency may be changing). If the reading is 0000 kHz or is changing rapidly, you probably don't have the counter cable connected to the VCO test point. If the reading is fairly stable but not between 8 and 10 MHz, refer to Troubleshooting.

☐ Tap **MENU** to exit **CAL FCTR**.

KAT2	KBT2	KPA100	KAF2	KDSP2	KNB2	K160RX	K60XV	KSB2	Multiple
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VCO Alignment

In the following steps you'll adjust the VCO inductor (L30) so that the VCO control voltage is in the proper range.

- ☐ Disconnect the internal frequency counter probe and remove it completely from the K2.
- ☐ Select 80 meters, and set the VFO for about 4000 kHz.
- ☐ Connect a DMM (digital multimeter) to the left end of resistor R30 (near the center of the synthesizer area of the RF board) and ground. Use a small alligator clip to ensure a good connection. (You can also use the built-in voltmeter to measure the VCO control voltage. Refer to Voltmeter Probe Assembly in Part I.)



It is possible to damage the slugs in slug-tuned inductors if you use a metal tool or if you tune the slug too far in or out. The tuning tool provided will not damage the slugs.

- ☐ Using the wide end of the plastic tuning tool, adjust the slug in inductor L30 until the voltage at R30 reads 6.0 V. If the voltmeter reading does not change at all as you tune L30 through its full range, refer to Troubleshooting. If the voltage changes but you cannot get to 6.0 V, you have probably wound the VCO inductor (T5) incorrectly or have installed the wrong value at L30 or C72.
- ☐ Set the VFO for approximately 3500 kHz.
- ☐ Measure and write down the VCO control voltage at this frequency in Table 6-1 (using pencil).
- ☐ For each remaining band, set the VFO to the low and high frequencies listed in Table 6-1 and write down the VCO control voltages.⁹ (You can tune quickly to the approximate frequencies in the table by selecting the 1-kHz tuning rate.)

⁹ Usable VFO coverage extends well beyond the ranges given in the table. 15 MHz is used as the upper boundary on 20 meters to allow reception of WWV at this frequency.

Table 6-1. VCO Voltage Readings

Band	Low Freq.	Voltage	High Freq.	Voltage
80 m	3500	_____	4000	_____
40 m	7000	_____	7300	_____
30 m	10000	_____	10150	_____
20 m	14000	_____	15000	_____
17 m	18000	_____	18200	_____
15 m	21000	_____	21450	_____
12 m	24800	_____	25000	_____
10 m	28000	_____	28800	_____

☐ If some of the above VCO control voltage readings are < 1.0 V, or some of them are > 7.5 V, you may be able to shift the entire set of readings so that they are all within the 1.0 to 7.5 V range. Switch to the band (and frequency) that had the highest or lowest voltage, then adjust L30 to bring that reading into range. Then re-measure all of the voltages to make sure they're in range.

☐ If you have some voltages that are < 1.0 V and others that are > 7.5 V, you may have installed the wrong value at one or more of the VCO capacitors (C71 - C74) or varactor diodes (D21 - D26). Another possibility is that T5 has the wrong number of turns or that you installed the wrong type of slug-tuned inductor at L30. **ALTHOUGH MOST LIKELY YOU EITHER FORGOT TO CHANGE THE EXTENDED VFO RANGE (D19) SECONDARY MENU SETTING TO "YES" (AS DESCRIBED ON PAGE 60), OR YOU DID A HARD FACTORY RESET WHICH UNDOED THIS CHANGE!** If you change any of these components **OR THE (D19) SECONDARY MENU SETTING**, you need to repeat the VCO alignment procedure.

- ☐ Disconnect the DMM from R30.
- ☐ Connect the internal frequency counter probe to the BFO test point, TP2 (right side of the RF board, near the crystal filter).



KAT2	KBT2	KPA100	KAF2	KDSP2	KNB2	K160RX	K60XV	KSB2	Multiple
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I.F. Amplifier Alignment

L34, located near the right front corner of the RF board, is used to peak the output of the I.F. amplifier.

- ☐ Using the wide end of the plastic tuning tool, adjust the slug in L34 until it is near the top of the can. **Stop turning the slug when it appears to be at the top or when you feel resistance.**
- ☐ Turn L34's slug one full turn clockwise (down into the can).
- ☐ Set the band to 40 meters using **BAND+** or **BAND-**. Select CW Normal and FL2 (700 Hz nominal bandwidth).

☐ Make sure the RF GAIN control is fully clockwise (max. gain). Disconnect the antenna from J4, if one was connected.

☐ Tap **PRE/ATTN** until the PRE annunciator turns on.

☐ Connect a pair of headphones (stereo or mono) to the front panel jack, and turn the AF GAIN control to about midway.

☐ Slowly tune the VFO to locate the weak internally-generated signal near 7000 kHz. If you can't hear the signal at all, you may have a receiver problem. Try the 40-meter Band Pass Filter Alignment, below, then refer to Troubleshooting if necessary.

☐ While listening to the signal at 7000 kHz, adjust L34 for best signal strength and lowest noise. This setting occurs at about 1 to 1.5 turns below the top of the can. (You can use your DMM on AC volts, at the speaker jack, to obtain a more sensitive indication.)

40-Meter Band Pass Filter Alignment

☐ Connect an antenna or a signal generator to the antenna jack on the rear panel. If you use a signal generator, set it for approx. 7150 kHz at an output level of about -100 dBm, or strong enough to activate the S-meter. If you're using an antenna, tune in a signal in the range of 7100-7200 kHz. If you cannot find a signal, you can use atmospheric noise from the antenna to peak the filter.

☐ Using the plastic tuning tool, adjust both L1 and L2 (back left corner) for peak signal strength. You may be able to use the bargraph if the signal is strong enough. If you do not hear any signals or noise, see Troubleshooting.



In CW mode, the frequency shown on the display takes into account an offset equal to your sidetone pitch. This allows you to determine a station's actual carrier frequency by matching their pitch to your sidetone, rather than by zero-beating the signal. The **SPOT** switch can be used for this purpose.

This completes 40-meter receiver alignment. You may wish to become familiar with the K2's receiver features before proceeding (see Operation). In Part III you'll install the remaining band-pass filters and align the transmitter and receiver on all bands.

Assembly, Part III

In this final RF board assembly section you'll install the transmitter components, as well as the remaining band-pass and low-pass filters. This will allow you to align and test the K2 on all bands.

☐ Turn off the K2 and disconnect the power supply. **See note 1**

☐ Remove the two screws holding the Front Panel board to the Control board, then unplug the Control board. Use the long-handled Allen wrench as described in Part I.

☐ Remove the bottom cover.

☐ Remove the screws from the front panel assembly and unplug it from the RF board.

☐ Remove the side panels by taking out the two screws along the bottom edge of each panel.

1) In order to protect them from physical damage during subsequent assembly, temporarily remove all Rework Eliminator™ option bypass headers from both the RF and CTRL boards.



KAT2	KBT2	KPA100	KAF2	KDSP2	KNB2	K160RX	K60XV	KSB2	Multiple
------	------	--------	------	-------	------	--------	-------	------	----------



PA transistors Q7 and Q8 (2SC1969) must be installed on the *bottom* of the PC board, with their metal tabs facing away from the board, as explained in the following steps. Locate the component outlines on the bottom of the board before proceeding.

☐ Prepare the leads of Q7 as shown in Figure 6-31. *Bend the leads upward, away from the tab--the opposite of the way you bent the leads of Q6. Form the leads using the shaft of a small screwdriver to create gradual bends. Do not install Q7 yet.*

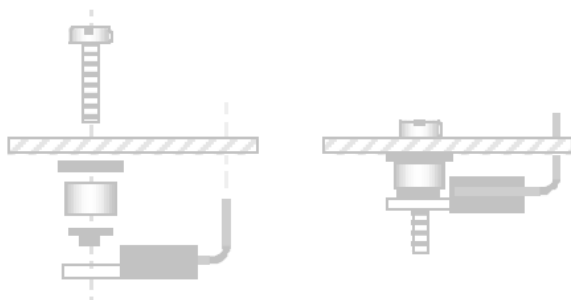


Figure 6-31

☐ Insert a 4-40 x 1/2" (12.7 mm) screw through the PC board hole for Q7's tab (see Figure 6-31). Then slip the hardware listed below onto this mounting screw from the bottom side. (The shoulder washer can be found with the MISCELLANEOUS components.)

- ___ #4 fibre washer (black)
- ___ 1/4" (6.4 mm) dia., 1/8" (3 mm) long phenolic standoff (brown)
- ___ #4 nylon shoulder washer (black)



Do not use any hardware other than that supplied. The height of the PA transistor assembly is critical for maintaining good heat dissipation.

☐ Place Q7 on the bottom of the board so that the leads are inserted into the PC board as indicated by Q7's component outline. The mounting screw and hardware should appear as shown in Figure 6-31. Do not solder yet.

☐ Make sure the smaller part of the shoulder washer is visible through the hole in Q7's metal tab.

☐ Secure Q7 and its hardware temporarily using a 4-40 nut and #4 lock washer. Tighten the nut only finger-tight.

☐ Once Q7 and its hardware appears to be parallel to the PC board as shown in Figure 6-31, solder Q7 on the top of the board.

☐ Repeat the steps above for the other PA transistor, Q8.

Uninstalled Components

☐ Check off the components listed below, verifying that they are not installed. All of these components are on the top side of the board.

Note: P6 and P3 will be installed on the next page. The remaining parts will not be installed.

___ W1 the RX Antenna Bypass jumper (behind the finals) is replaced by the UN-K160RX header.

___ W6 the Transverter Bypass jumper (behind and to the left of the driver Q6) is replaced by the UN-K60XV header.

___ P6 (near DC input jack); supplied with KAT2 or KPA100

___ P3 (near crystal filter); supplied with KBT2 or KPA100

___ C167 (behind J11) is replaced with the UN-J11 UN-KSB2 header.

___ W2 and W3, the crystal filter bypass jumpers. (See note 1.)

___ W5 the Noise Blanker Bypass jumper (in front of Q22). (See note 2.)

___ R90 (forward from W5). (See note 2.)

___ J5 (near BFO crystals); reserved for future use

___ X2 (front left corner); not used

1) Jumpers W2 and W3 (near J9 and J10 respectively) are both replaced by the UN-J9/10 UN-KSB2 header.

2) The UN-KNB2 header replaces W5 and the attenuator originally formed by R88 (now 2.7k), R89 (now W89), and R90 (not installed).

REWORK-FREE K2 ASSEMBLY

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KAT2

KBT2

KPA100

KAF2

KDSP2

KNB2

K160RX

K60XV

KSB2

Multiple

Option Module Standoffs

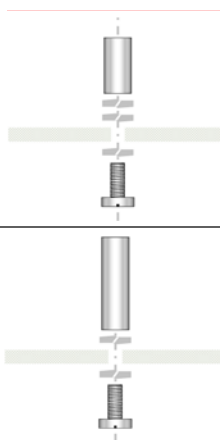
The three aluminum and the one nylon standoff and their associated hardware, are supplied with the individual Elecraft® options, and also with the corresponding Rework Eliminator™ K2 PCB parts kits.

[] Referring to the assembly diagrams, install aluminum standoffs for the following three RF board mounted options using a ¼" (6 mm) machine screw, and the specified number of split lock washers.

— Install the KSB2 3/8" (9.5mm) standoff (left of J9), using a total of **three** split lock washers.

— Install the KNB2 3/8" (9.5mm) standoff (behind J12), using a total of **three** split lock washers.

— Install the K160RX 5/8" (16mm) standoff (left of J14), using just **two** split lock washers.



[] Install the K60XV's nylon standoff as follows.

— Remove the nut securing Q6, the (TO-220 style package) driver transistor, but leave the associated securing screw and lock washer.

— Install the 9/16" (14 mm) long nylon standoff in place of this nut using the original screw and lock washer. Do not over tighten the screw, as this could strip the spacer's soft nylon threads.

Auxiliary Plugs

The Aux 12V plug (P3) is provided with the Elecraft® KBT2 and KPA100 options, or the Rework Eliminator™ Aux 12V Plug kit.

The Aux RF plug (P6) is provided with the Elecraft® KAT2 and KPA100 options, or the Rework Eliminator™ Aux RF Plug kit.

[] Install and solder 2-pin male connectors at P6 and P3 so they are oriented as shown by their silkscreen outlines, i.e. **with their plastic polarizing tabs toward the front of the RF board.**

☐ If you have the KNB2 (Noise Blanker) option, locate the ~~Installation~~ section of the KNB2 manual. Complete only the installation of J12 and the standoff. ~~Do not remove W5, R88, R89 or R90 at this time.~~

Transverter Jumper*

[] Install a coax cable jumper between V RFDET and J13-6 **per the instructions and picture on page 9 of the Elecraft® K60XV manual.**

Visual Inspection

☐ Examine the bottom (solder side) of the RF board carefully for unsoldered pins, solder bridges, or cold solder joints. Since this is a large board, you should break the examination up into three parts:

___ perimeter area ___ front half ___ back half

☐ Examine the top (component side) of the RF board for unsoldered pins, solder bridges, or cold solder joints. This step is necessary because some components are installed on the bottom of the board and soldered on top.

☐ Make sure switch S1 on the RF board is in the OFF position. (Plunger OUT is OFF.)

[] Re-install all un-module bypass headers on the RF and CTRL boards.

Resistance Checks

☐ Perform the following resistance checks.

Test Point	Signal Name	Res. (to GND)
Q7 collector	12V	> 500 ohms
Q6 base	Driver bias	100-140 ohms
Q7 base	PA bias	2.5 - 3.0 k
U11 pin 8	8A	> 250 ohms
U10 pin 8	8T	> 500 ohms
U12 pin 1	8R	> 500 ohms

* This step calls for RG174 coax, solid hookup wire, and heat-shrink tubing. The Elecraft® K60XV option and Rework Eliminator™ K60XV Parts kit provide more than enough of these miscellaneous wire items.

Appendix A – Required K2 PCB Parts

The following table lists all of the parts – electrical components, connectors, miscellaneous wire, and mounting hardware – required to make current K2s “Option Ready” for each option. It also shows how to obtain these parts, either from Elecraft® options or from our parts kits. In addition to the color-coded portion of the table, please **read the footnotes** for all of the options you **aren’t** getting with your K2, but which you still want it to be “Option Ready” to accept.

“Option Ready” Support for This Elecraft® Option		Requires Either of These Kits			Which Supply These K2 PCB Parts	
		Elecraft®		Rework Eliminator™	Reference Designator(s)	(Quantity) / Description
KIO2 ¹		K2		-	CTRL-P4	2×5 pin DIP plug
KPA100 ²	KAT2	KPA100	KAT2 KBT2	Aux RF Plug	RF-P6	2-pin .156" plug
	KBT2			Aux 12V Plug	RF-P3	2-pin .156" plug
KAF2 or KDSP2 ³		KAF2 or KDSP2		Aux Filter Jacks	CTRL-J1 CTRL-J2	5-pin SIP jack 3-pin SIP jack
KNB2		KNB2		KNB2 Parts	RF-J12 RF-R88 - - -	8-pin SIP jack 2.7 kΩ, 5%, ¼ W 3/8" Aluminum standoff Machine screw (3) Lock washer
K160RX ⁴		K160RX		Updated Caps	RF-C68 RF-C153	10 pF NPO 68 pF NPO
				K160RX Parts	RF-J14 RF-C75 RF-C13, C14 - - -	16-pin SIP jack 470 pF NPO ("471") (2) 1200 pF NPO ("122") 5/8" Aluminum standoff Machine screw (2) Lock washer

(continued)

“Option Ready” Support for This Elecraft® Option	Requires Either of These Kits		Which Supply These K2 PCB Parts	
	Elecraft®	Rework Eliminator™	Reference Designator(s)	(Quantity) / Description
K60XV⁵	K60XV	K60XV Parts	RF-C71 RF-D19, D20 RF-J13 RF-J15 - - - -	120 pF (2) MV209 8-pin SIP jack 3-pin SIP jack 9/16" Nylon standoff 2' RG174 coax 6" #24 Solid hookup wire 3" Heat-shrink tubing
KSB2	KSB2	KSB2 Parts	RF-J9, J10 RF-J11 FP-Rbias FP-C4 – C8 FP-P1 FP-Q3 FP-R13 FP-RP3 - - -	(2) 3-pin SIP jack 12-pin SIP jack 10 kΩ, 5%, ¼ W (5) .01 uF 0.2" (5 mm) 2×8 pin DIP plug 2N3906 68.1 kΩ, 1%, ¼ W 10 kΩ × 4 resistor network 3/8" Aluminum standoff Machine screw (3) Lock washer

¹ A stock K2 is already “Option Ready” for the Elecraft® **KIO2** option.

² “Option Ready” support for the Elecraft® **KPA100** option requires RF-P6 and RF-P3, both of which are provided with the KPA100. If you have a stock K2, you will need both the Rework Eliminator™ **Aux RF Plug** and **Aux 12V Plug** kits to make your K2 **KPA100** “ready”.

³ The Elecraft® **KAF2** (analog filter) and Elecraft® **KDSP2** (advanced DSP) auxiliary audio filter options both include the same two K2 PCB jacks. If you have a stock K2, you will need the Rework Eliminator™ **Aux Filter Jacks** kit to make your K2 “Option Ready” for either of these optional filter modules.

⁴ Beyond the K2 PCB parts required for current K2s, the Elecraft® **K160RX** also includes two replacement caps which are only needed for “older model” K2s. These two caps are **not** included with the Rework Eliminator™ **K160RX Parts** kit. Instead, they are available via the Rework Eliminator™ **Updated Caps** kit. If your un-built K2’s S/N is less than 3060, you should check the values of these two caps to determine if you also require this kit to make your K2 “Option Ready” for the **K160RX** option.

⁵ Pre-S/N 4060 K2s require updated firmware to make them “Option Ready” for the Elecraft® **K60XV** option. This updated firmware normally retails for \$54, however (according to the **K60XV** manual), it is available at no charge to owners of pre-S/N 4060 K2s who purchase the **K60XV**. Because of this, we recommend only making pre-S/N 4060 K2s **K60XV** “ready” if you already have the **K60XV** and the necessary updated firmware.

Appendix B – Annotated K2 Schematics

The schematics on the following six pages are annotated to depict the configuration of an “Option Ready” K2. Using the same color code as the previous two sections, these schematics show ...

- Which K2 parts are *option supplied*, and with which option or options they are provided.
- The six option supplied parts that must replace original K2 parts. These are shown in **bold blue font**.
- Which parts must be removed or preferably were never installed. These include one cap, one resistor, and five option bypass jumpers.

If you are building a current model (serial number 4060 or greater) K2, you can ignore the rest of this page. Please also ignore all of the annotations in *italic font* (including those in *red italic font*) in the following schematics.

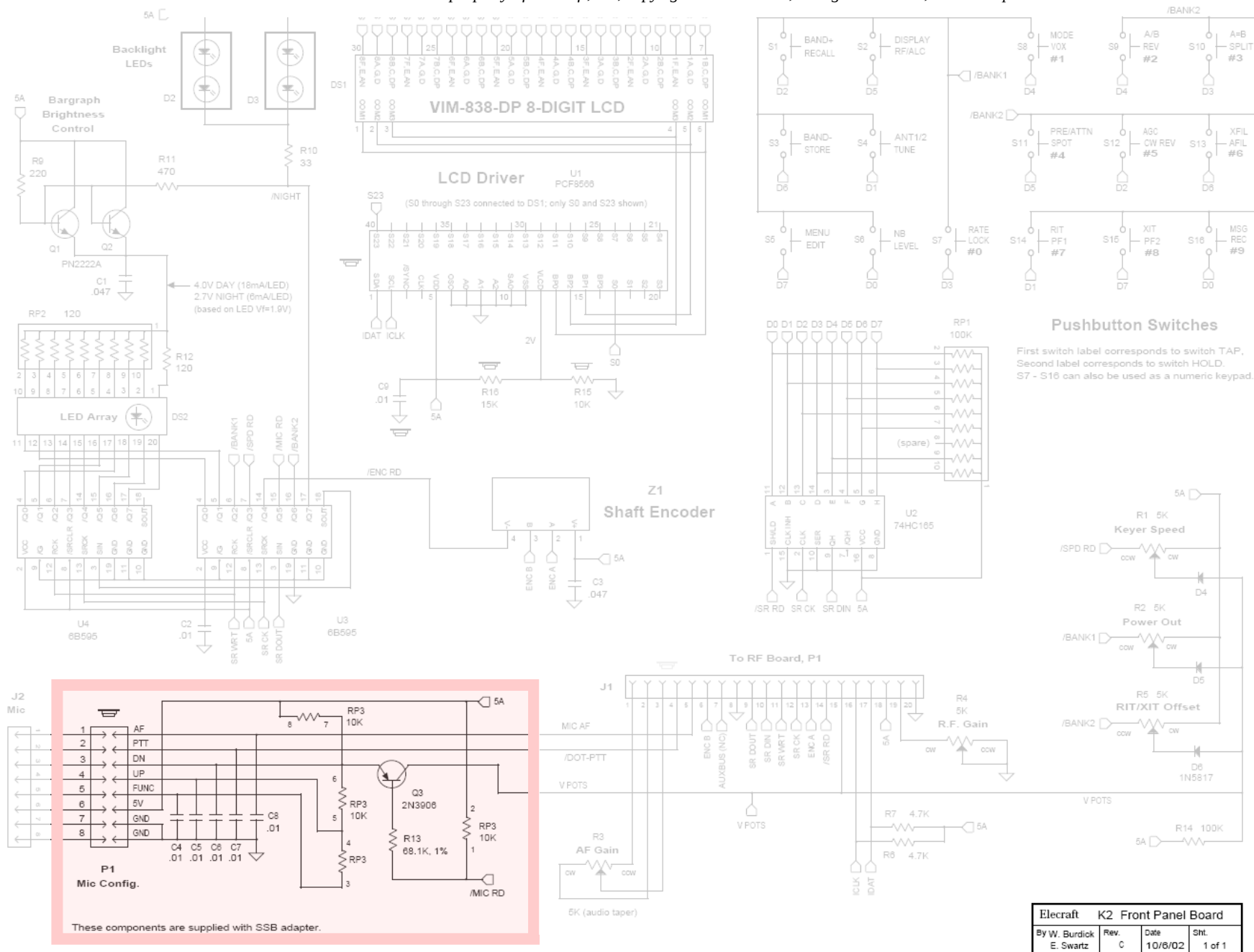
It is critical that you know your firmware revision level. Especially if you want to make a pre-4060 K2 “Option Ready” for the K60XV option. If you don’t have the latest firmware, then you will need to purchase it from Elecraft, Inc. for \$54.00! In contrast, if you buy the K60XV option from Elecraft and at the time of purchase you inform Elecraft that you have an older K2, then the K60XV manual states that they will provide the updated firmware at no extra charge. THIS IS LIKE GETTING THE K60XV FOR LESS THAN HALF PRICE!

For those of you building or upgrading older (pre-S/N 3000) K2s with the rev. A RF board, the schematics have comments that explain ...

- Which components in older K2s need to be changed. There are two, both are caps, and both are supplied with the K160RX. These are shown in *red italic font*.
- Which option supplied parts must be soldered (point-to-point) on the bottom of the RF board because there are no mounting holes for them. There are only three and they are all supplied with the K60XV. These are shown in *italic font*. Since there are no mounting holes for these three parts, we recommend that you not make a pre-S/N 3000 K2 “Option Ready” for the K60XV, unless you definitely plan to install it.

Even with the above comments, the following schematics still do not describe all of the differences between current (post 4059) and older (pre-4060) K2s. In addition to firmware changes, we are aware of several other differences, including the PLL temperature stability mod and the keying wave-shaping mod. However, we choose not to document them here as they are beyond the scope of this guide.

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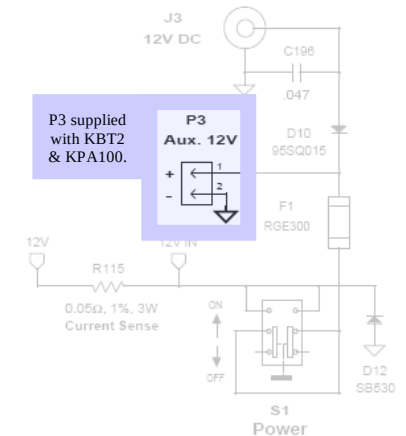
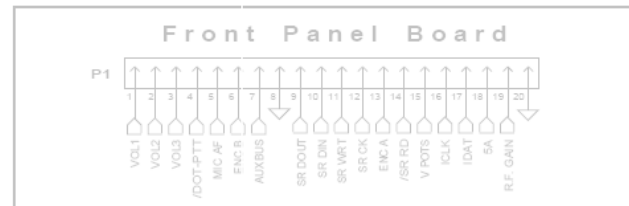
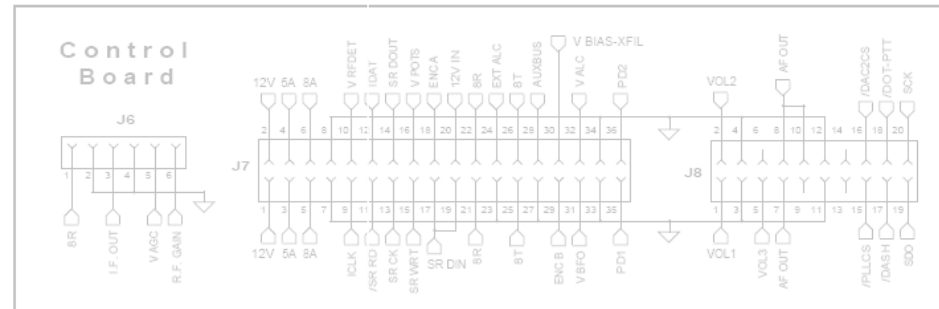
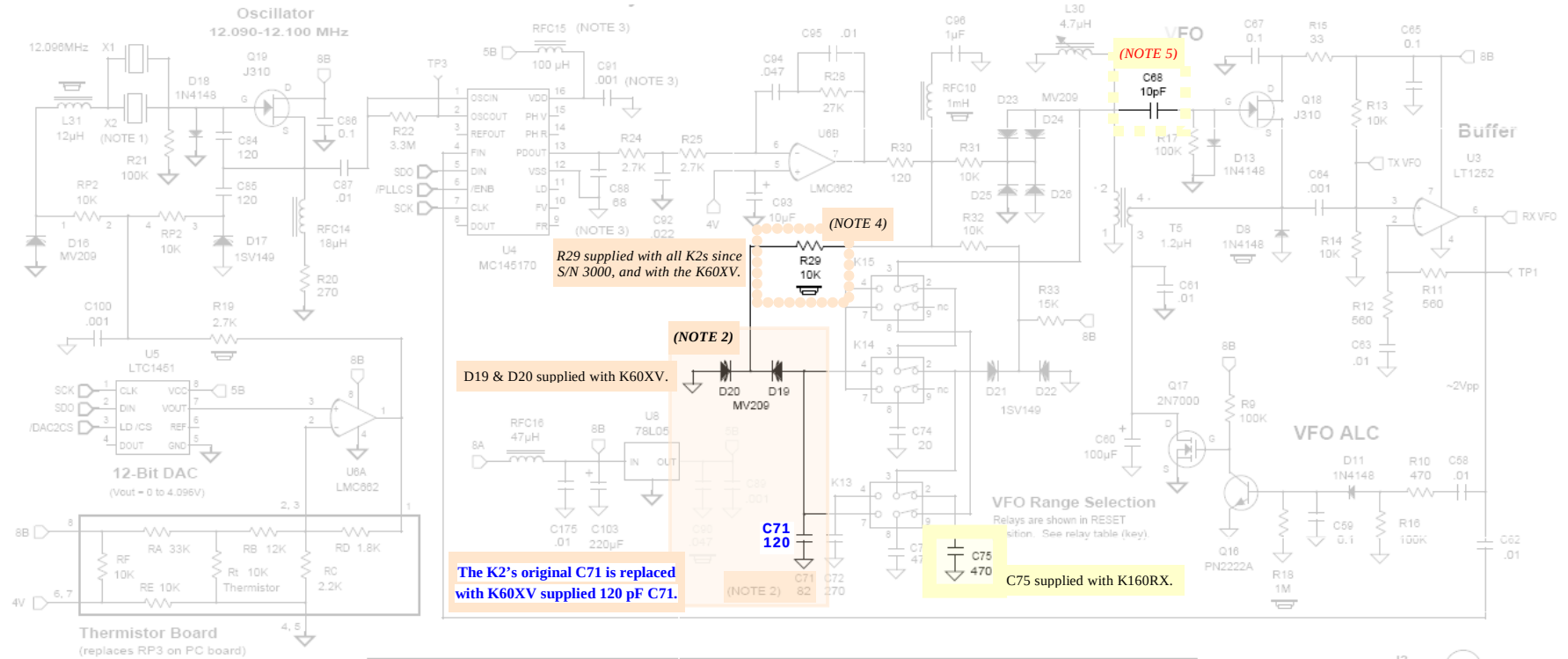
Elecraft K2 Front Panel Board			
By W. Burdick	Rev. C	Date 10/6/02	Sht. 1 of 1
E. Swartz			

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 = on bottom of PC board

Elecraft K2 Control Board			
By W. Burdick E. Swartz	Rev. F	Date 1/27/04	Sht. 1 of 1

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Elecraft K2 RF Board			
By W. Burdick	Rev. F	Date 1/27/04	Sht. 1 of 4
E. Swartz			

Appendix B

NOTE 1: X2 is not used.

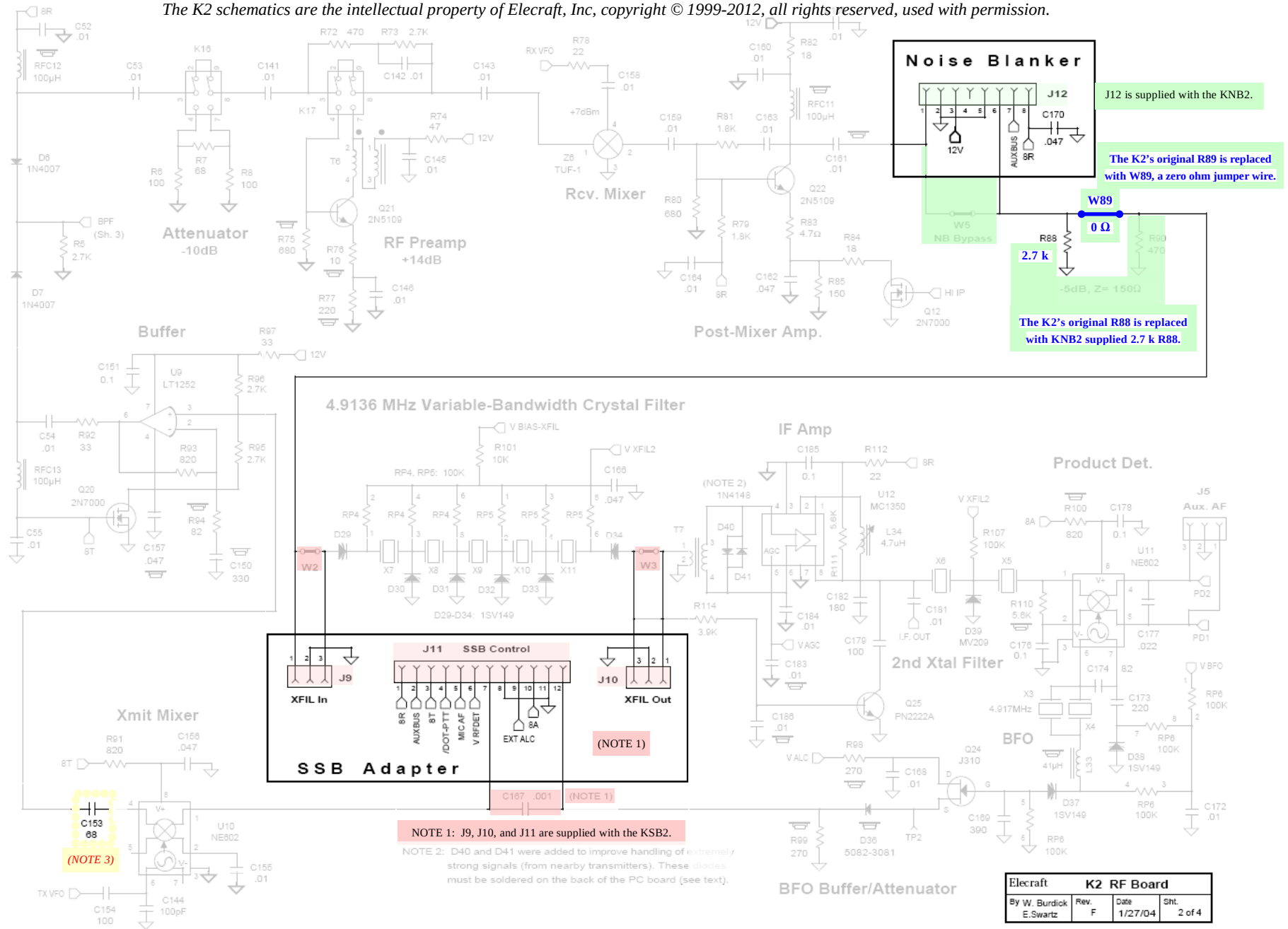
NOTE 2: Pre-S/N 3000 K2s (those with the earlier rev. A RF board) don't have mounting holes for D19 and D20.

NOTE 3: These components improve PLL stability; they must be soldered on the back of the board (see text).

NOTE 4: Pre-S/N 3000 K2s (those with the earlier rev. A RF board) don't have mounting holes for R29.

NOTE 5: C68 is 10 pF in current K2s. It is included with the K160RX because older K2s used a different value. It is not included with the Rework Eliminator™ K160RX Parts kit, but is provided with the Rework Eliminator™ Replacement RF Caps kit.

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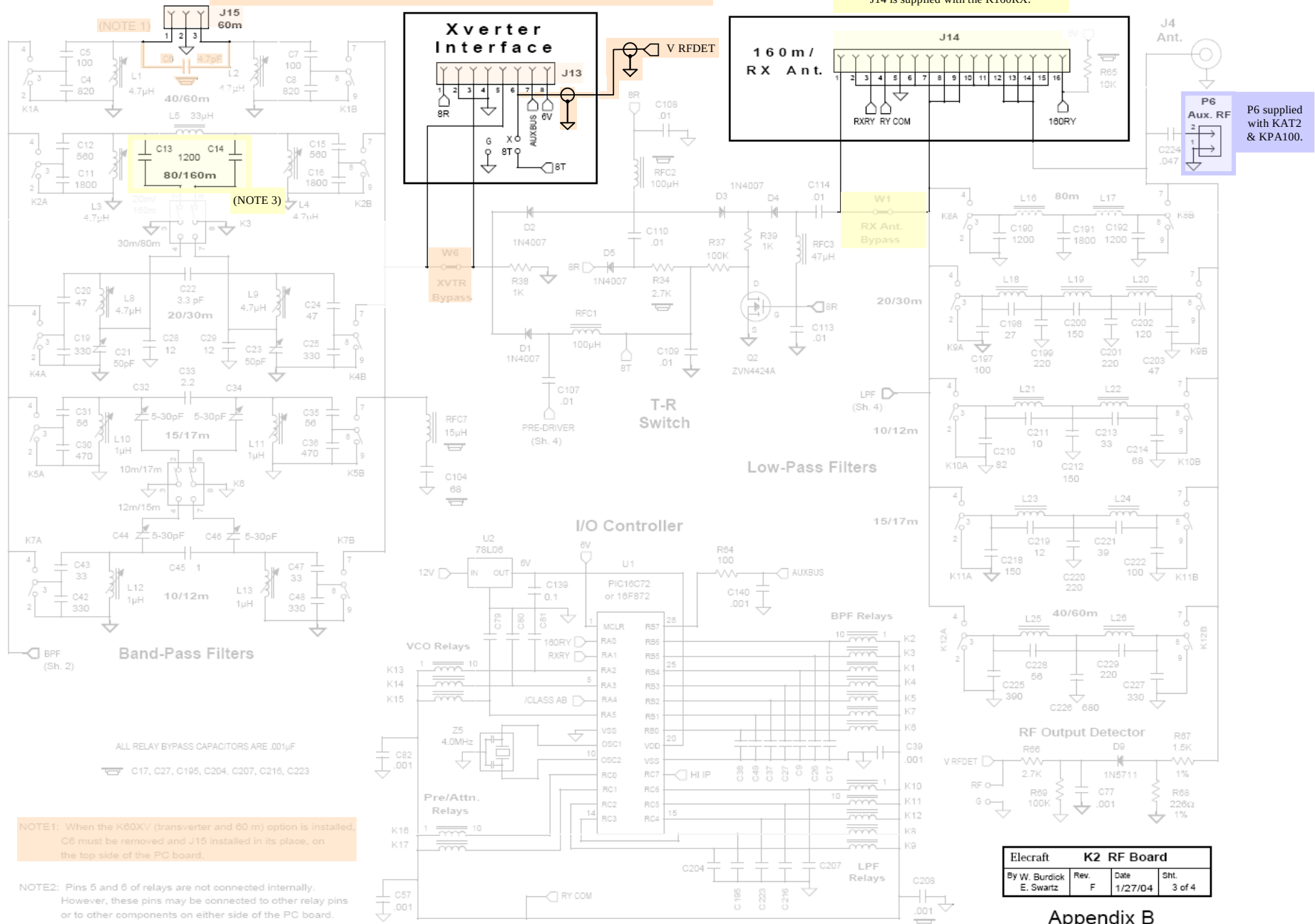


Appendix B

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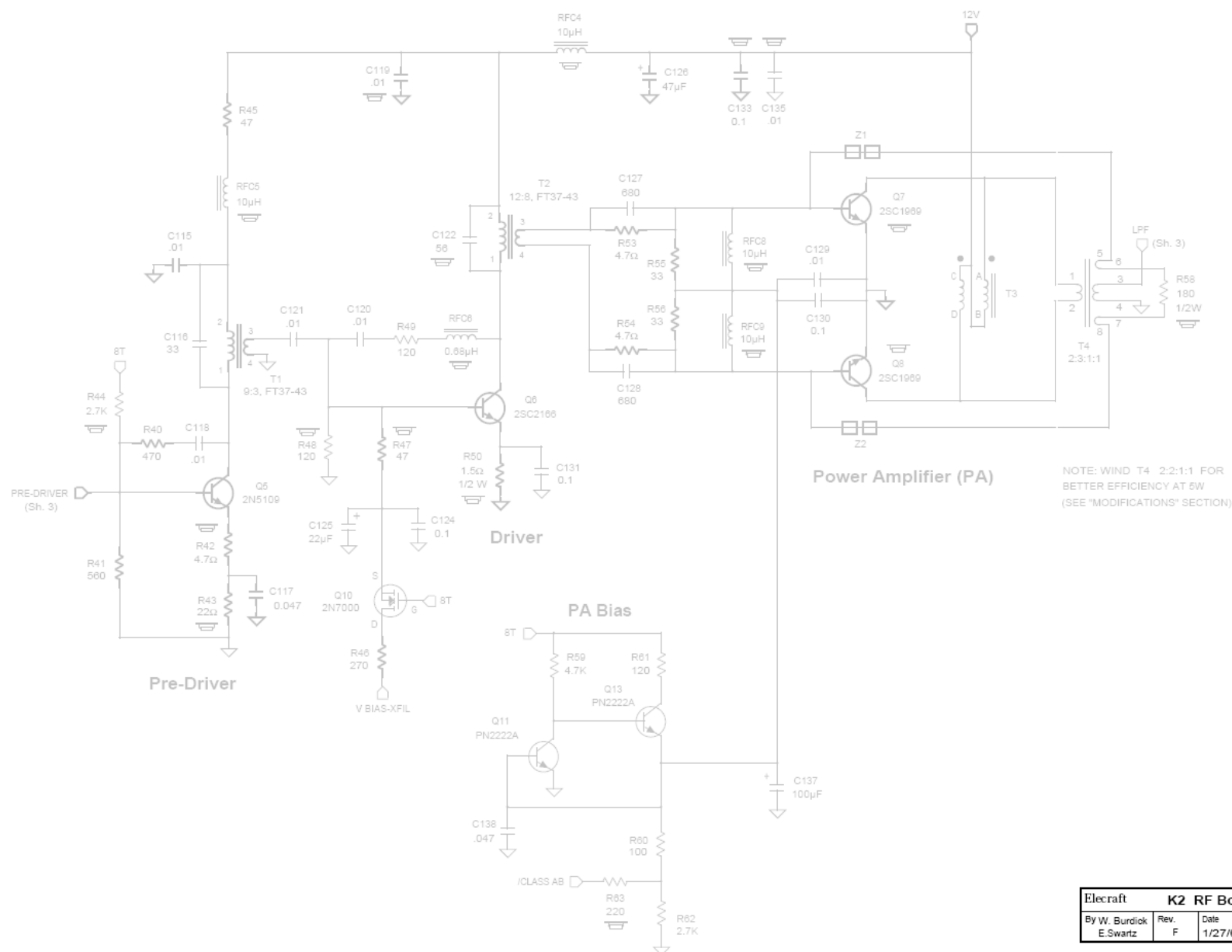
J15, J13, and the RG174 coax cable for jumpering V RFDET to J13-6, are supplied with the K60XV.

J14 is supplied with the K160RX.



Appendix B

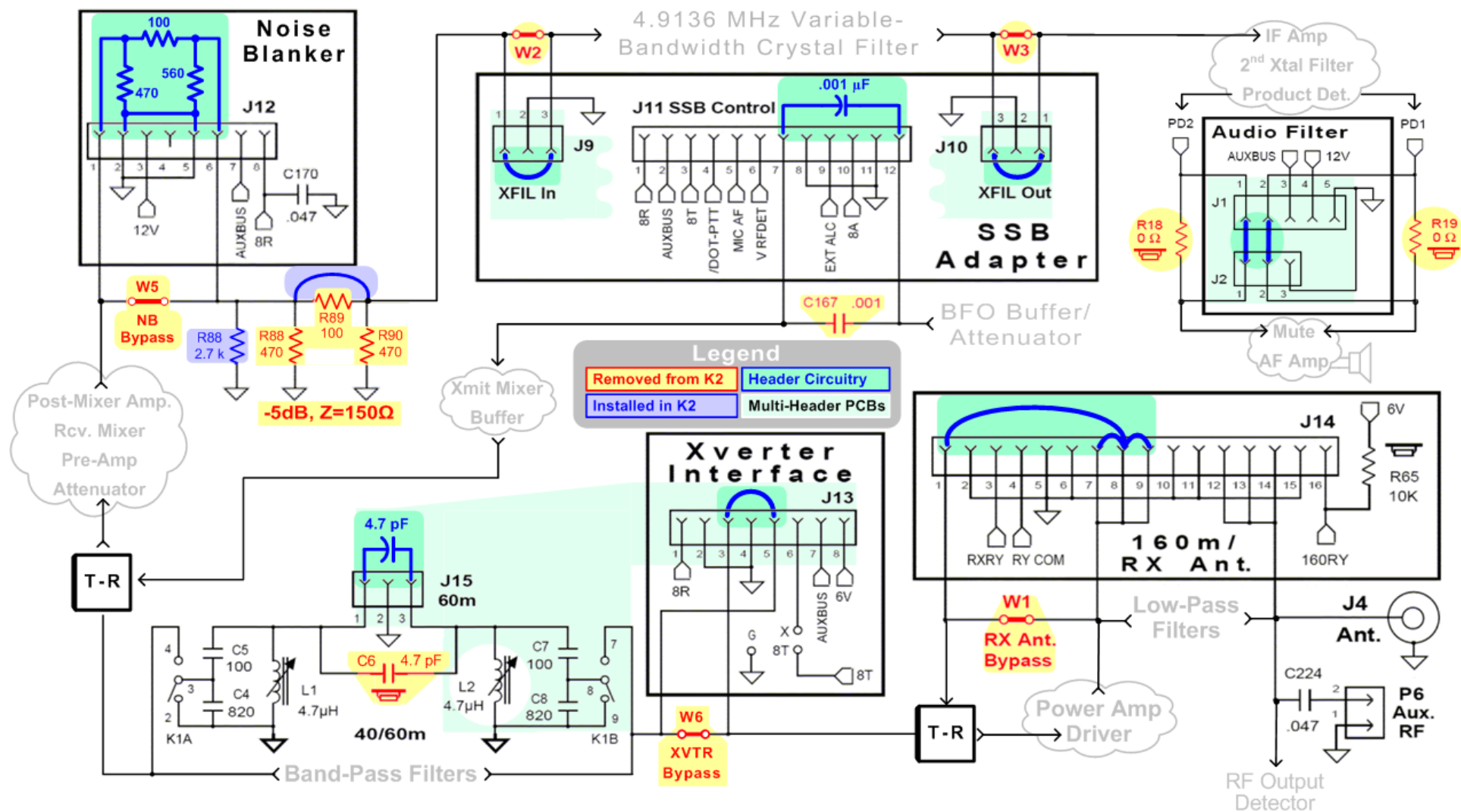
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Elecraft K2 RF Board			
By W. Burdick E. Swartz	Rev. F	Date 1/27/04	Sht. 4 of 4

Appendix B

Appendix C – Color-Coded K2 Un-Module Diagram



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